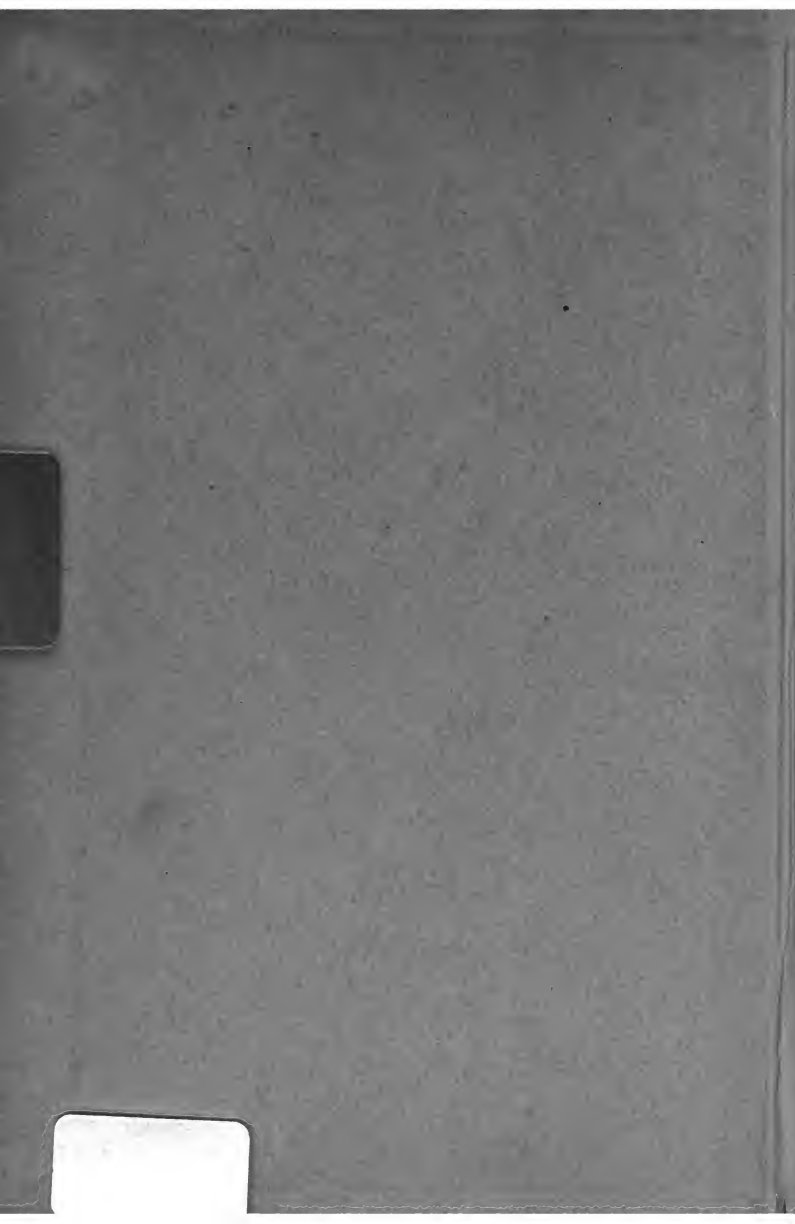


Annual report



Canada

Canada Sept. 6, 1890.
continuing
CANADA.

ANNUAL REPORT

OF THE

MINISTER OF PUBLIC WORKS

FOR THE FISCAL YEAR 1889-90

ON THE WORKS UNDER HIS CONTROL.

SUBMITTED IN ACCORDANCE WITH THE PROVISIONS OF CHAPTER THIRTY-SIX,
SECTION 37, OF THE REVISED STATUTES OF CANADA.

PRINTED BY ORDER OF PARLIAMENT.



PRINTED BY BROWN CHAMBERLIN, PRINTER TO THE QUEEN'S MOST
EXCELLENT MAJESTY.

1891.



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CANADA.

REPORT

OF THE

MINISTER OF PUBLIC WORKS

FOR THE

FISCAL YEAR ENDED 30TH JUNE 1890.

To His Excellency the Right Honourable Sir Frederick Arthur Stanley, Baron Stanley of Preston, in the County of Lancaster, in the Peerage of Great Britain; Knight Grand Cross of the Most Honourable Order of the Bath; Governor General of Canada, and Vice Admiral of the same, &c.

MAY IT PLEASE YOUR EXCELLENCY:

In compliance with the requirements of Chapter 36, Section 37, of the Revised Statutes of Canada, I have the honour to submit the Annual Report of the Department of Public Works for the fiscal year ended 30th June, 1890.

This report is divided into four parts; the first contains a statement of the expenditure of the Department, amounting to \$5,717,897.75, of which the details will be found in Appendix No. 1, pages 7 to 23, followed by the annual reports of the Chief Architect, Chief Engineer, Chief Mechanical Engineer, the Superintending Officers of the slides, etc., on the different districts, of the Superintendent of the Government Telegraph Service, and of other officers of the Department, as well as statements containing information pertaining to the Department.

The second part contains the reports—with appendices—submitted by the Commission appointed to investigate the causes of the floods at Montreal and vicinity.

In the third part will be found records of Engineers and their Assistants employed on Public Works, exclusive of railways; of Superintendents; and of Public Works and the engineers engaged on them from their commencement.

Part four refers to Canada from the Atlantic to the Pacific, showing its progress, water and land routes, having special reference to the northern portion of the Dominion. Also a record of the Heads, Deputy Heads and Chief Officers of the Department from 1841 to 1890.

The works under the control of this Department are:—

PUBLIC BUILDINGS, their construction and maintenance.
HARBOURS AND PIERS, their improvement and construction.
WORKS ON NAVIGABLE RIVERS.
DREDGING AND DREDGE VESSELS.
ROADS AND BRIDGES.
SLIDES AND BOOMS, and collection of revenue therefrom.
TELEGRAPHS.

DESCRIPTION OF WORK DONE.

The following is a description of the work done during the fiscal year on Public Buildings, Harbours, Rivers and Dredging, arranged by Provinces.

PROVINCE OF NOVA SCOTIA.

PUBLIC BUILDINGS.

During the fiscal year which closed on the 30th June, 1890, the sum of \$37,375.54 was expended on construction and repairs of Public Buildings in this Province.

At ANNAPOLIS, a site for a Post Office and other Government Offices having been obtained on the corner of St. George and Railway streets, on the 7th June, 1889, a contract for the construction of the building was entered into. It will be of two and a-half stories, of brick, on a stone foundation, 58 feet by 35 feet, with a one-story brick annex for an examining warehouse, 13 feet by 31 feet.

Work has been continuously carried on during the past year, and the building will, it is expected, be completed during 1890-91.

HALIFAX.—A contract for the erection of an Immigration Building at the Deep-water Terminus was entered into 14th April, 1890, and the building is now practically completed. It is a one-story wooden building, 262 feet in length, but of varying width, from 58 feet at its greatest to 7 feet at its least, and, excepting three small offices for baggage, tickets and agent, the floor space is undivided.

Adjoining is an old three-story and attic wooden warehouse, 50 feet by 30 feet, which has been fitted up and now furnishes the following accommodation :

On the ground floor a stairway, hall, kitchen, coal store, storeroom and pantry; on the second flat a dining-room and pantry; on the third flat eight rooms and in the attic four rooms.

NAPPAN.—The buildings for the Experimental Farm were described in my report of last year, and are now practically completed. The Superintendent's residence will be supplied with a heating apparatus, plans of which are being prepared.

PICTOU.—A new drain from the Custom House, with a catch basin, has been put in.

At SYDNEY, work on the building—to contain the Post Office and other Government offices—described in my report of last year—has been carried on continuously.

In April last, a contract was entered into for the construction of a heating apparatus.

Repairs, alterations, and improvements were effected to the following buildings:—

AMHERST.—Public Building; ANTIGONISH.—Public Building; HALIFAX.—Dominion Building; Examining Warehouse; NEW GLASGOW.—Public Building; TRURO.—Public Building; WINDSOR.—Post Office; YARMOUTH.—Public Building.

(Part I, Appendix No. 2, pages 27-29.)

HARBOURS AND RIVERS.

During the year there has been expended on construction and repairs the sum of \$53,213.30, which does not include the cost of dredging charged to the appropriation for dredging in the Maritime Provinces, which amounted to \$16,958.99.

ARISAIG.—The extension of the pier 100 feet and the protection of the same by a talus of large stone, on its seaward face, was nearly completed at the end of the fiscal year.

At **BARRINGTON**, the first and second sections of the pier referred to in my report of last year, as well as 300 feet of pile-work, have been completed.

At **BIG LORRAINE**, a straight channel was opened through the western extremity of the bar obstructing the entrance, the depth obtained being 2 feet at low water on a width of 20 feet.

BIG TRACADIE.—With the amount appropriated by Parliament the work of improving, by dredging, the navigable channel at this place was carried on.

CHETICAMP.—A contract was entered into 10th June, 1889, for the construction of a wharf on the eastern side of the harbour, to consist of an approach 125 feet in length and 30 feet in width over a distance of 60 feet from its outer end, with side walls of stone and centre filling of earth or stone; and an extension 80 feet in length, in two blocks, with openings of 17 feet 6 inches. The outer block is to be 60 feet in length along the channel face, and to have a depth of 11 feet at extreme low water.

At the end of the fiscal year the approach was completed and the remainder of the work well under way.

EAST BAY.—During the year a site was selected and a wharf built on the north side of the East Bay of the Bras d'Or Lake, half a mile to the westward of McAdam's Point and $5\frac{1}{2}$ miles to the westward of the head of the bay. The distance to Sydney is $17\frac{1}{2}$ miles and to the nearest station on the Cape Breton Railway $10\frac{1}{2}$ miles. The structure is 220 feet in length and 20 feet wide, with a return of 20 feet at the outer end, giving a channel or end face 40 feet in length. The depth at the outer end is 10 feet at the lowest lake level, or 11 feet 3 inches at extreme high lake level.

EAST RIVER, PICTOU.—A number of boulders were removed during the year, and points of rocky ledges cut through.

At **EATONVILLE**, the top of the breakwater constructed during 1887–88 was cut down to the level of the extension, and its inner face close-piled. The new top was built simultaneously with the extension, a distance of 203 feet, and the whole work was completed in a satisfactory manner.

The total length of the breakwater is 220 feet, and its width on top 20 feet, sloping about 1 in 6 on the seaward face and end.

ECONOMY.—The breakwater and wharf combined, constructed by the Department at this place in 1887–88, has been, during the past year, extended 100 feet in length, with a width on top of 25 feet, and an L. 25 feet by 25 feet, built on the eastern side of the outer end.

At **FRENCH COVE** the boat landing was improved by the removal of rocks and boulders.

At **GREEN COVE**, bedded rocks and boulders were removed over a distance of 60 feet, measured along the shore, to enable fishing boats getting to land with greater safety.

GROSSES COQUES.—The greater portion of the pier at this place was renewed by the Department, assisted by the inhabitants who supplied some materials and labour.

At JONES HARBOUR a landing wharf and breakwater have been constructed inside the mouth of the harbour, to enable the fishermen to use a larger class of boats, and also to give them landing facilities.

The wharf is 175 feet long, and consists of an inshore end 90 feet long and 15 feet wide, built of large stone; a centre portion of cribwork, which is of the same width and 45 feet long, and an outer or channel block 40 feet long and 20 feet wide, also of cribwork. It has, at its outer end, a depth of 9 feet at low tide.

At LISMORE, the work done during the year consisted in obtaining an additional depth of one foot on the reef which lies beyond the outer end of the wharf.

MABOU.—The brush and stonework constructed off the entrance to this harbour was raised during the period covered by this report.

MARGAREE.—During the year 1889-90 a contract was entered into for repairs to the pier and for an extension 200 feet in length, 20 feet in width on top, over a distance of 170 feet, and 25 feet over the remaining 30 feet. The work under contract has been prosecuted vigorously since the spring, and is approaching completion.

At NEGRO ISLAND the beach protection work was extended and the old portion repaired.

PORT GEORGE.—Storms of the autumn of 1888 destroyed the outer end of the breakwater at this place over a length of 190 feet, rendering the harbour practically useless.

During the Session of 1888-89 an appropriation of \$5,000 was made for re-building the breakwater, and during the present fiscal year a contract was entered into for carrying out this work, but owing to difficulty in obtaining timber, and other delays, active operations were not begun until late this spring, since which time the work has progressed rapidly.

At PORT GREVILLE, the top of the beach protection work was re-constructed over a length of 2,040 feet, and a cribwork wall 120 feet long built along the bank on the northern side of the mouth of the harbour.

At PORT HOOD, the amount appropriated for the year 1889-90 was expended in building and close-piling a block 71 feet in length and 24 feet in width against the outer face of the pier between the north corner and the close-piling, constructed in 1888-89, and connecting it with new top work back of it; in renewing the close-piling over a distance of 34 feet on the north side of the pier near the outer end, and in repairs to the covering of the pier and to the rip-rap of the stone slope on its north side.

PORTER'S LAKE.—A channel 400 feet in length leading from the lake to Three Fathom Harbour was re-opened during the year, the same having been closed by an accumulation of gravel and shingle.

PORT MAITLAND (OR GREEN COVE).—In the winter of 1887-88 the breakwater at this place was seriously damaged by a succession of storms, a breach 86 feet in length

being made directly through the middle of the structure, and \$500 was expended by the Department in clearing away the wreckage and securing the work from further damage.

During the year a contract has been entered into for making good the breach and repairing the other parts of the structure where required.

SHEET HARBOUR.—In January, 1889, a contract for the construction of a ballast wharf, on the eastern side of the East River, was entered into.

This wharf, which was completed in November of the same year, was built from the end of the remains of Hall's Wharf, and extended southerly a distance of 180 feet. It is 20 feet wide, and has an L, 20 feet by 20 feet, at its southern end.

At **THREE FATHOM HARBOUR**, the beach protection work has been extended northwardly, and other work done.

TIDNISH RIVER.—A contract has been entered into for the construction of a public wharf on the south-eastern side, and near the mouth of the river. This wharf is to be 220 feet in length on the centre line, 20 feet in width, with an L 20 x 20 feet on the upper side of the outer end, and a stone approach; the depth at its outer end will be 9 feet at high water.

At **TWO RIVERS**, some large boulders were removed from the mud flats on the banks of the navigable channel of the Big River.

WALLACE.—During the past year the wharf at this place was extended a further distance, the total length of the structure being, at the present time, 345 feet.

WESTERN HEAD.—The stone breakwater at this place was repaired and re-built over a length of 106 feet.

At **West Jordan Bay** a pier 144 feet in length, 18 feet in width and 13 feet high at the outer end, has been built at the back of the island, to prevent the gravel being swept into the channel.

Repairs and improvements were made to the undermentioned piers and breakwaters in this Province, viz.:—

CHURCH POINT, COW BAY, DIGBY, McNAIR'S COVE, PARTRIDGE ISLAND PIER, PORT MEDWAY, ROUND BAY and SUMMERVILLE.

Dredging was done at the following places:—

ARISAIG, BARRINGTON, COW BAY, LOCKEPORT, MABOU, MAIN A DIEU, Market Wharf PICTOU, and TRACADIE.

(Part I, Appendix No. 5, pages 68 to 83, and 112 to 149).

PRINCE EDWARD ISLAND.

PUBLIC BUILDINGS.

The sum of \$1,649.11 was expended on construction and repairs to Public Buildings in this Province during the year.

CHARLOTTETOWN.—The town water supply was connected with the Dominion Building, and the grounds laid out in grass plots, walks, etc. Other repairs and improvements were effected on this building.

At **MONTAGUE**, the plaster, woodwork, etc., of the Post Office, were repaired. (Part I, Appendix No. 2, page 27).

HARBOURS AND RIVERS.

The sum of \$10,777.56 has been expended on account of this service during the year. This does not include the sum of \$9,757.21, the cost of dredging, and charged to the general appropriation for dredging in the Maritime Provinces.

CASCUMPEC.—At this place, the work of excavating a channel through the inner bar has been continued, and some 4,000 cubic yards of rock have been blasted, ready for removal by a dredge. By adopting this procedure it is anticipated the channel will be completed at an earlier date and at less cost.

At **CHAPEL POINT** a contract has been entered into for repairing the superstructure of the existing pier and extending it a distance of 44 feet; at the close of the fiscal year about half of the work was completed.

At **CHINA POINT**, extensive works of renewal and repairs were commenced by the Department, under contract, nearly half of the work undertaken being completed at the end of the year.

GENERAL REPAIRS AND IMPROVEMENTS were made on the following piers, viz.: **ANNANDALE**, **BELFAST**, **HICKEY'S**, **KIER'S SHORE**, **LAMBERT'S**, **MALPEQUE** breakwater, **NEW LONDON** breakwater, **NORTH RUSTICO**, **PINETTE**, **PORT SELKIRK**, **POWNAL**, **St. MARY'S BAY**, **SOURIS** (or **COLVILLE BAY**) breakwater, **SOUTH RIVER** and **STEVEN'S**.

DREDGING was done at **CHARLOTTETOWN**, **NORTH RUSTICO**, **RED POINT** and **SOUTH RUSTICO**.

(Part I, Appendix No. 5, pages 61 to 68, and 113 to 149.)

NEW BRUNSWICK.

PUBLIC BUILDINGS.

On construction and repairs, there was expended on Public Buildings in this Province, during the year, the sum of \$15,671.68.

BATHURST.—A clock was placed in the tower of the Public Building.

DALHOUSIE.—The Post Office, etc., building, has been completed and is being fitted up. Heating apparatus is also being supplied. Cribwork was built during the year to protect the site from the wash of the sea.

FREDERICTON.—Further grading has been done, and plans prepared for a heating apparatus for the Post Office, etc., building.

St. JOHN.—The yard of the Custom House on Water street was laid with asphalt, and the furnaces under the boilers were re-laid and supplied with new dead-plates.

At WOODSTOCK, a clock has been placed in the turret of the Post Office, Custom House, etc., building.

REPAIRS AND IMPROVEMENTS were made to the Post Offices at CARLETON and MONCTON, to the Public Building, NEWCASTLE, to the quarantine station on PART-RIDGE ISLAND, St. John, to the PORTLAND Post Office; at St. JOHN to the Custom House, Post Office, Marine Hospital, Penitentiary and Savings Bank, and to the Public buildings at St. STEPHEN'S and SUSSEX.

(Part I, Appendix No. 2, pages 30 to 32.)

HARBOURS AND RIVERS.

Expenditure on construction and repairs, \$71,244.05.

At CAMPBELLTON, in order to provide a place of deposit for ballast, a contract was entered into on the 23rd April, 1889, for the construction of a "ballast wharf," the proposed structure being an isolated block 140 feet in length by 35 feet in width, and having at it a depth of 18 feet at extreme low water, spring tides.

At the close of the year the wharf was nearly completed, having been built up to the specified height.

A length of 116 feet of a landing for the steamer crossing from Campbellton to Cross Point on the opposite side of the river, was constructed by day's labour.

CAPE TORMENTINE.—At the close of the fiscal year the stone embankment had been completed to its full length, viz: 1,300 feet—on top—and the cribwork portion commenced.

At EDGETT'S LANDING, the contractors being unable to carry on the work, the Department assumed the same in May last, and is carrying it to completion.

At FORT DUFFERIN, at the inner end of Negro Point Breakwater, St. John Harbour, a further length of 100 feet of protection work has been built.

At GRAND ANSE, the L, or return, at the western end of the breakwater, was extended 100 feet towards the shore.

LINCOLN.—For many years the wharf at this place has, owing to its bad state, been unserviceable; to make it, therefore, of use to the public, it was, during the year, completely repaired and enlarged.

At MIZZONETTE, the wharf referred to and described in my report of last year was completed and taken off the contractor's hands on the 19th September, 1889.

At RICHIBUCTO, a further length of 94 feet has been added to the inner end of the "beach protection" work, connecting it with the Sand Hills, and it is hoped its further extension will be unnecessary.

On the RIVER ST. JOHN navigation was improved by the removal of boulders, sand bars, rocky ledges and snags between the mouth of the River St. Francis and the City of St. John, and the tow-path was repaired at different points. A number of rocky ledges were also blasted and removed on the TOBIQUE, one of its tributaries.

At St. LOUIS, the wharf which was commenced during the fiscal year 1888-89, and described in my report of that year was completed on the 21st September, 1889.

SHIPPEGAN.—On the 26th November a contract was entered into for the construction of an additional block at the end of the eastern or present breakwater, and of a breakwater extending 1,100 feet in a southerly direction from the western beach at the entrance of the "Gully." Materials for the works were got out during the past winter, a large portion having been delivered at the site by the end of the fiscal year, and 7 feet in height of the "additional block" (40 feet by 50 feet) had been built, placed in position and secured by ballasting.

The works so far built at the "Gully" have given most favourable results, improving the depth of water in the channel fully 2 feet, and already proving of great benefit to the fishing fleet of the harbour and surrounding districts.

REPAIRS AND IMPROVEMENTS were made to the works at **MISPEC**, **QUACO** and **UPPER SALMON RIVER**.

Dredging was done at the following localities during the year, viz: **DALHOUSIE**; **GRAND LAKE**; **RIVER KENNEBECASIS**; **OROMOCTO SHOALS**, River St. John; **RICHIBUCTO**; and the Traverse, **RIVER RESTIGOUCHE**—the amount expended being \$14,957.95 and charged to the appropriation for Dredging in the Maritime Provinces.

(Part I, Appendix No. 5, pages 84 to 90, and 112 to 149).

PROVINCE OF QUEBEC.

PUBLIC BUILDINGS.

On construction and repairs there was expended, during 1889-90 the sum of \$107,982.23, on the following public buildings:—

AYLMER, Post Office.—This building has been completed and occupied.

CARILLON, Inland Revenue Offices.—The offices have been fitted up and furnished and necessary outbuildings constructed.

CHICOUTIMI, Marine Hospital.—A drain from the hospital to the river was put in, the hospital was painted throughout, and the reservoir enlarged.

COATICOOK.—The public building at this place has been completed, fitted up and occupied.

FRASERVILLE, **RIVIÈRE DU LOUP**.—On the 27th November, 1889, a contract was entered into for the construction of a building—to contain the Post Office, Customs and Inland Revenue Offices—on the corner of Iberville and Champlain streets. The building is to be two stories, basement and attic, 62 feet by 35 feet, to contain on the ground floor the Post Office and Examining Warehouse; on the first floor the Customs and Inland Revenue Offices; on the attic floor the caretaker's apartments, and in the basement the heating apparatus and fuel. The outside walls are to be of stone, the partitions, floors and roofs of brick.

JOLIETTE.—The Post Office, &c., building, described in a previous report, has been completed and occupied.

LACHINE, Post Office, &c., Building.—A contract for the construction of this building on lot No. 253, fronting on St. Joseph street, was entered into on the 30th September, 1889. The building consists of a main portion 40 feet by 30 feet and an annex 20 feet by 11 feet, the ground floor for the Post Office, and first and attic stories for the caretaker's apartments. The walls are to be of stone; the partitions, floors and roof of wood. The front gable will carry a wooden clock turret with four openings for dials.

MONTREAL.—At the Custom House extensive renewals of metal roof covering, ornamental vases and woodwork of eaves were carried out, and alterations of plumbing and boiler were made; some new gas fittings were supplied and a new and larger gas main was put in the cellar.

A one-story wooden building, 25 feet 6 inches by 13 feet 6 inches, on a stone foundation, was built at the lower entrance of the Lachine Canal for the transaction of Customs business.

Extensive renewals and improvements were effected to the boilers, engines, heating apparatus, &c., at the Examining Warehouse.

At the Post Office, a new safe was supplied for the Northern Receiving Office; the Assistant Postmaster's Office was enlarged and other work done.

ST. HYACINTHE.—On 19th March, 1889, a site, consisting of Lot 225, and a portion of 524, on the corner of Girouard and St. Joseph streets, with frontages of 81 feet 6 inches and 133 feet 3 inches, respectively, was acquired, and plans, &c., for the construction of a public building have been prepared.

ST. JEROME.—The Public Building at this place was completed, fitted up, furnished and occupied.

ST. VINCENT DE PAUL PENITENTIARY.—A large amount of construction and works of improvement were carried out by convict labour during the year, a description of which will be found in the report of the Chief Architect, on pages 35 and 36 of the Appendices, Part I.

Repairs and improvements were carried out on the Marine Hospital, CHICOUTIMI; Quarantine Hospital, GROSSE ISLE; Post Office, HULL; Custom House, Examining Warehouse, Inland Revenue Office and Post Office, MONTREAL; the Citadel, Custom House, Examining Warehouse, Immigration Building, Marine Hospital and Post Office, QUEBEC; and to the Custom House and Post Office at THREE RIVERS. (Part I, Appendix No. 2, pages 32 to 36).

HARBOURS AND RIVERS.

There has been expended during the year on construction, repairs and improvements the sum of \$322,900.25. To this may be added \$2,725,504.10, being the expenditure on the ship channel of the St. Lawrence between Montreal and Quebec, assumed by the Dominion.

BAIE ST. PAUL.—A contract has been entered into for the construction of an addition of 75 feet in length to the wharf at Cap aux Corbeaux, which will have a depth of 9 feet at the end at low water.

CAP CHATTE.—The channel has been cleared of rock, and vessels can now enter with safety.

AT CAP DE LA MAGDELEINE, the wharf was ballasted, the approach raised, filled with ballast and planked.

AT CAP SANTÉ, a large number of boulders were removed from the channel leading to the wharf.

CHENAL DU MOINE.—Materials have been procured for the construction of an additional ice pier.

CHICOUTIMI.—The head of the wharf at this place was extended westwardly a distance of 130 feet.

CONTRECEUR.—A channel was opened from the main channel of the river to the Village of Contrecoeur, a beacon erected on Ile Hurteau, and two small ones were placed on the main shore for guidance through the channel at the bend.

COTEAU LANDING.—The approach to the wharf 800 feet in length, the re-building of which was commenced in March, 1889, was completed in August of the same year.

GRAND PABOS.—A number of dangerous rocks were removed from this harbour during the past fiscal year, and crib-work 215 feet in length, 24 feet in width, of and average height of 10 feet, was built.

ILE PERROT.—The connection between the block built on the north side of the island in 1887-88 has been completed, its width being 16 feet. A shed 16 by 20 feet was also constructed.

AT ILE VERTE, a further length of work to connect the block built at the mouth of the river with the shore was constructed.

AT KAMOURASKA, an extension 110 feet long, 25 feet wide and 13 feet high, was built, and repairs to the old portion of the wharf were commenced.

LAPRAIRIE.—The retaining wall, 335 feet in length, commenced in 1888, was completed in the autumn of 1889.

LONGUEUIL.—The work of connecting with the shore the block built by the Department in 1887-1888 has been carried on by the contractor during the past fiscal year, and, it is expected, will be completed before the winter sets in.

NEWPORT RIVER.—The eastern retaining wall was extended 90 feet, and the old work repaired where required.

NICOLET.—An additional length of 686 feet of pile-work was constructed during the year, stone was placed in those parts of the work where settlement had taken place, and a quantity of sand which had washed into the channel was removed by a dredge.

POINTE A VALOIS.—The wharf under construction at this place consists of a block 75 feet by 25 feet, with an approach of 110 feet, 20 feet in width. There is a depth of 6 feet 3 inches of water at its outer end, and the total height of crib-work is 17 feet, but it was not completed at the end of the fiscal year.

AT POINTE ST. PIERRE a dangerous granite reef rendered the harbour unsafe. Its removal has been commenced, and the work was progressing well at the close of the fiscal year.

PORT DANIEL.—On the 15th of November, 1889, a contract for the construction of an additional length of pier at Port Daniel, 70 feet by 50 feet and 27 feet in height was entered into. At the close of the fiscal year about one-half of the work had been done.

RIMOUSKI.—A contract has been entered into for the construction of a protection pier, 325 feet in length, 18 feet in width, on the westerly side of the wharf at its outer end, and on the 30th of June last the work was in progress.

RIVIÈRE DES PRAIRIES.—On the 24th October, 1889, a contract was entered into for the construction of two piers one at St. Geneviève and the other at St. Raphael de l'île Bizard, County Jacques Cartier, and at the close of the fiscal year the greater part of the materials required had been delivered in readiness for an early commencement of work.

RIVER DU LIÈVRE.—During the year the work of constructing a lock and dam, and other works, at the Little Rapids, has been continued.

On the **RIVER L'ASSOMPTION** the stream was improved by the construction of guide piers, one at the head of Chute Monte à Peine and the other at the foot of the falls.

On the **RIVER MEKINAC** a number of boulders were removed from the channel in the first and second rapids above the mouth of the river.

RIVER RICHELIEU.—An additional ice pier was commenced near the mouth of the river, but not completed at the close of the year.

RIVER ST. FRANCIS.—During the year dredging was continued opposite Tourville's Mills, at St. Thomas de Pierreville, and other points on the river.

RIVER ST. MAURICE.—A channel 2,800 feet in length, 30 feet in width and 9 feet deep at low water was dredged during the year in the western channel of the river up to the highway bridge.

RIVER YAMASKA.—The heavy rains of September, 1889, raised the water in the river to such a height that a break occurred in the dam. That portion which remained was repaired and strengthened, and the Petit Chenal was closed.

SHIP CHANNEL, RIVER ST. LAWRENCE.—The work of improving the River St. Lawrence from Montreal to Quebec was continued during the year by the Department, the principal points operated at being Cap à la Roche, Pouillier Rayer, Cap Charles and Grondines.

STE. ADELAIDE DE PABOS.—In June, 1888, a contract was entered into for the construction of a strongly-built breakwater, 200 feet in length, to afford shelter to the boats engaged in the fishing industry in this locality, and the work has been satisfactorily completed.

STE. ANNE DE LA PÉRADE.—A further quantity of dredging was done to improve the navigation of this river.

At **STE. ANNE DU SAGUENAY** a further length of work has been built, but the wharf is not completed.

ST. LAURENT.—On the 4th of February last a contract was entered into for the construction of an additional length to the pier of 60 feet, 60 feet wide at the outer

end and 50 feet at its junction with the old structure, and was well in hand at the close of the fiscal year. The depth of the water at the end of the new structure will be 9 feet at low water spring tides.

ST. SIMÉON.—On 20th December, 1889, a contract was entered into for the construction of an isolated block 40 by 50 feet dimensions, with 13 feet at its outer end at low water spring tides, and at the close of the fiscal year the work was well under way.

ST. TIMOTHÉE.—During the summer of 1889, the wharf which has a length of 100 feet, was extended out 45 feet, the extension being 45 feet by 100 feet. The steamers have no trouble in swinging round since the construction of this extension.

TADOUSSAC.—A further portion of this wharf was repaired and raised 3 feet, the face timbers of the outer end were renewed and a temporary slip built.

THREE RIVERS.—In November last a contract was entered into for the construction of a wharf between the Richelieu and Ontario Company's wharves and the Harbour Commissioners', and at the close of the fiscal year the contractor had delivered a large amount of the materials required.

TROIS PISTOLES.—The 60 feet extension to the wharf commenced in 1888 has been completed, and another extension of 50 feet square has been commenced.

Repairs and improvements were made to the piers or wharves at the following places: BAIE ST. PAUL, Isolated Block; BERTHIER (*en bas*); ETANG DU NORD; GATINEAU POINT; GEORGEVILLE; ILEAUX COUDRES; LES EBOULEMENTS; MURRAY BAY; RIVIÈRE OUELLE; RIVER ST. DAVID; ST. ALPHONSE; ST. IRÉNÉE; ST. MICHEL DE BELLECHASSE.

The sum of \$13,648.14 was expended from the vote for "Dredging Quebec and Ontario" at the following places: BEAUHARNOIS; BOUCHERVILLE, River St. Lawrence; CHATEAUGUAY; COMO and HUDSON, River Ottawa; KIERNAN BAY; LACHINE; MONTEBELLO and POINTE AUX ANGLAIS, River Ottawa; RIVER DU LOUP (*en bas*); RIVER L'ASSOMPTION and ST. PLACIDE. (Part I., Appendix No. 5, pages 91-101 and 114-149.)

PROVINCE OF ONTARIO.

PUBLIC BUILDINGS.

The expenditure for construction and repair of Public Buildings in this Province for the year amounted to \$579,734.65.

ALMONTE.—A contract was entered into on the 11th June, 1889, for the erection of a post office and building on a site obtained at the junction of Mill and Little Bridge streets. It is to have a main portion $2\frac{1}{2}$ stories and basement 51 feet by 31 feet, and a one story annex 27 feet by 18 feet. The walls are to be brick, with stone dressings, on stone foundations; the work has been carried on during the year, but is not completed.

BRAUMPTON.—The Post Office, etc., building, which was described in my report of last year has been completed, fitted up, furnished and occupied.

DAYTONA.—The post office building was completed and occupied.

DECATUR.—The additions to the Post Office, Custom House, etc., have been completed.

DENVER.—A granolithic sidewalk has been laid on the line of the street.

DETROIT.—The Post Office, etc., building, described in my report of last year is expected to be completed at an early date.

DIAZ.—Plans have been prepared and a contract entered into for a hot-water heating apparatus.

DULUTH.—At the Post Office building the attics were fitted up for the use of the postmaster, the basement water closets removed, and a new set of ventilated water closets constructed in the attic.

HAMILTON.—A clock was supplied and fitted up in the tower of the Post Office, and the eaves supplied with troughs and other work executed.

LEWISAY.—The Public Building at this place is completed and occupied.

MAINE.—The building for the Post Office, Customs and Inland Revenue at Bangor has been completed, fitted up, furnished and occupied, and a clock placed in the tower.

MINNAPOLIS.—Central Experimental Farm.—The greenhouses and seed store, cottages No. 1 and the stable described in my report of last year, were completed during the year 1889-90. A silo 40 feet by 20 feet and 24 feet in height, was constructed as a lean-to at the western end of the barn. Two cottages, similar to No. 1 were also erected, one each at two of the entrance gateways. A 1½ story wooden building 55 feet by 55 feet, for use as an implement and harness shed, was constructed on the northern side of the barnyard.

MINNAPOLIS.—Legislative Buildings.—A large steel and iron vault has been constructed in the new Block for the Finance Department; the offices now occupied by the Department of Agriculture and the Department of the Interior in the new building on Wellington street have been repaired and furnished, and many necessary improvements made to various offices in the Western Block.

MINNAPOLIS.—Legislative Buildings.—The slate covering was removed from the front roof of the building from the eastern to the western wing, and was replaced by copper, and the skylights on the House of Commons Chamber were replaced by others.

MINNAPOLIS.—Printing Bureau.—This building is completed, fitted up and occupied.

MINNAPOLIS.—Victoria Hall.—A fence has been erected on the O'Connor and Queen street fronts of this building occupied by the Fishery Exhibit and the National Art Museum.

MINNAPOLIS.—The Post Office, Ac., building has been completed and occupied.

MINNAPOLIS.—A clock was fitted up in the tower of the Post Office.

PRESCOTT.—The Public Building, for the Post Office, Customs and Inland Revenue Offices, has been completed and will shortly be occupied.

STRATFORD.—A two story and basement addition, measuring 46 feet by 14 feet, was constructed at the eastern side for the use of the Post Office Inspector. The basement contains a furnace room, a fuel room and a W. C.; the ground floor, an Inspector's office and a Clerk's office; and the first floor, a stationery office and a Clerk's office. The two lower stories are of stone and the upper of brick. Fittings and furniture and a separate hot-water apparatus were provided.

STRATHROY.—A contract was entered into on 31st July, 1889, for the erection of a post office, etc., on the corner of Front and Centre streets. The main building 41 feet by 54½ feet, will consist of a basement, ground floor, first floor and attic, a four story tower 15 by 15 feet, and a one story annex 50 feet by 21 feet. The foundations of stone, brick superstructure with wooden floors, partitions and roof.

The ground floor will be occupied by the Post Office, the first floor by the Excise, the attic by the caretaker and the annex by the Weights and Measures.

ST. THOMAS.—Post office, etc.—An iron fence on a stone wall was erected on the front street, and the heating apparatus extended. Other improvements were also effected.

TRENTON.—The Post Office, etc., building at this place has been completed and occupied.

Repairs, alterations and improvements have been effected at the Post Office, etc., AMHERSTBURG; Post Office, etc., BARRIE; Post Office, BERLIN; Post Office, etc., DUNDAS; Post Office, etc., HAMILTON; Post Office, ORANGEVILLE; Government House, OTTAWA; Departmental Buildings, OTTAWA, while the Parliament Grounds and Major's Hill Park were kept in good order. Various streets, under the control of the Department, were graded and macadamized, and otherwise improved, and the roadways, sidewalks and footpaths were kept clear of snow during the winter; Post Office, PORT COLBORNE; Post Office Inspector's Office, PORT ARTHUR; Custom House, Examining Warehouse, Immigration Building, Inland Revenue Office and Post Office, TORONTO. (Part 1, Appendix No. 2, pages 36 to 42.)

HARBOURS AND RIVERS.

There was expended on construction and improvements of harbours and rivers in this Province during the year the sum of \$381,192.

COBOURG.—The outer end of the western pier has been re-built and other work done.

COLLINGWOOD.—A number of large boulders and other obstructions were removed from the channel and other parts of the harbour.

DRESDEN.—In September, 1889, a contract was awarded for the construction of sheet-pile protection work on the north-west side of the turning basin. At the close of the year the work was well under way, being nearly completed.

KING ARDINK.—During the past fiscal year the sheet-piling of the south and east ends of the basin was completed, and the pile protection work on the inside of the northern pier was extended a distance of 200 feet northwardly.

KINGSBURY.—The removal of Point Frederick Shoal was continued, 2,754 cubic yards of rock being removed.

KINGSBURY, DRY DOCK.—At the close of the fiscal year the bulk of the excavation had been completed, and a large quantity of stone delivered for floor, altars, and much work done in the construction of wharfing, and in filling and grading the grounds.

LITTLE CURRENT.—The work of improving the channel was continued and 2,265 cubic yards of rock were blasted and removed.

LITTLE NATION RIVER.—The removal of the shoal at the mouth of Moose Creek had been completed.

MILFORD.—In August, 1889, a contract was entered into for the construction of dredging works.—Cribwork, 80 feet in length and 20 in width, at the north end of the eastern breakwater, cribwork, 160 feet in length and 20 in width at the south end of the eastern breakwater; sheet-piling, 200 feet long, at the east end of the entrance to the inner harbour.

These were satisfactorily completed in May last, and a quantity of stone was used in the pile work of the old breakwater, and a space between the breakwater and the shore was also filled with stone.

MILFORD.—In August last a contract was entered into for the construction of a dredge, capable of 2,000 feet of work on the harbour front, and was nearly completed at the close of the fiscal year.

MILFORD.—On the 9th October, 1889, a contract was entered into for dredging, and other improvements in the harbour, and at the close of the fiscal year the contractors had delivered a large amount of materials, and were getting their plant ready for active operations.

During April and May dredging was done over a part of the channel at the entrance to the harbour, which had become shoaled. The length dredged was 2,400 feet, to a width of 60 feet, and to a depth of 16 feet 5 inches at lowest water.

PRINCE OF WALES.—The harbour improvements at this place were completed in August last, and at the close of the fiscal year a dredge was engaged in obtaining a greater depth of water.

PORT ARTHUR.—During the fiscal year ended 30th June, 1890, good progress was made by Messrs. Kirby & Stewart on the 1,500 feet of breakwater completed by them in May, 1889, and the whole will be completed within the time specified in their contract.

A large amount of heavy stone was paid for as materials for the old work, as well as of that under construction.

PORT PHILIP.—A channel 870 feet long and 175 feet wide was dredged to a depth of 20 feet to deep water outside, and a berth opened for vessels at the east end of the wharf.

PORT HOPE.—The superstructure of the railway wharf was re-built in part and repaired.

PORTSMOUTH.—The re-building of the superstructure of the pier at this place was continued and nearly completed on its entire length.

RIVER KAMINISTIGUIA.—During the past year a further amount of dredging was done in the river to better accommodate the large steamers now plying on these waters.

RIVER OTTAWA, BETWEEN PEMBROKE AND THE PETEAWAWA RIVER.—During the last fiscal year the dredging of the shoal which obstructed the channel leading to the Culbute Canal was carried on, and 2,216 cubic yards of sand and gravel were removed. To indicate the new channel way, which has a depth of 8 feet, ten buoys were placed on the north side of the channel.

RIVER THAMES.—Difficulty being experienced by vessels entering or leaving the river owing to the bar off its mouth in Lake St. Clair, a dredge operated in opening a passage through this obstruction.

SOUTHAMPTON.—In December last a contract for the construction of an addition of 200 feet to the landing pier and necessary dredging was entered into, but at the close of the fiscal year little progress had been made.

SUMMERSTOWN.—The warehouse has been completed and other work done.

TORONTO.—In May, 1889, a contract was entered into for improving the eastern entrance, the works required consisting of the dredging of a channel 300 feet in width to a depth of 12 feet below low water, the construction of protection works on either side of the new channel, and the continuation and completion of the harbour protection works on the eastern side of the proposed entrance—extending from Fisherman's Island westwardly to a junction with the channel works.

During the past fiscal year a channel 250 feet in width and to a depth of 12 feet was dredged through the gap, 122,000 cubic yards of sand having been removed.

The contractors have delivered materials for the piers, and framing of cribs has been commenced.

A large quantity of heavy stone was placed in the talus in front of the breakwater at the island, a total length of 3,700 feet having been thus protected. This work was done by day's labour, under direct charge of the Department.

WIARTON.—On the 8th November, 1889, a contract was entered into for the construction of a breakwater 380 feet in length and 25 feet in width, near the head of the harbour, on the west side, to afford protection to small craft; and at the close of the fiscal year the work was nearly completed.

Repairs were made to the structures at the following places, viz.:—**BURLINGTON CHANNEL; GODERICH; KINGSVILLE; PORT ALBERT; SAULT STE. MARIE.**

There was expended on dredging at the undermentioned places the sum of \$17,454.83: **BOWMANVILLE; BRIGHTON; GODERICH; KINCARDINE; KINGSVILLE; NEWCASTLE; PORT HOPE; RIDEAU RIVER, North Branch; POINT EDWARD, River St. Clair; SOUTHAMPTON and THORNBURY.**

(Part 1, Appendix No. 5, pages 101 to 108 and 115 to 149.)

PROVINCE OF MANITOBA.

PUBLIC BUILDINGS.

During the year the sum of \$61,168.32 has been expended on construction and repairs of Public Buildings.

GRANDS.—On 21st September, 1889, a contract was entered into for the construction at the Experimental Farm of the barn and stabling, and on the 21st of October, 1889, for the construction of the Superintendent's residence, both of which are now in progress.

The Superintendent's residence is to be a two-story and attic wooden building on a concrete foundation, having on the ground floor a hall, a sitting-room, a dining-room, an office, a kitchen and a shed; on the first floor four bedrooms, and in the attic three bedrooms.

The Post Office building, described in my report of last year, has been carried on very far but is not completed.

ST. PATRICK.—The buildings for the Industrial School which were described in my report of last year have been completed, and a drain put in from the school to the Red River.

ST. MOUNTAIN.—Penitentiary.—A brick passageway between the prison and the laundry was built, the Surgeon's and Chaplain's residences, referred to in my report of last year, have been completed and fitted up, summer kitchens added to the laundry stages, and a smoke-house, 12 by 12 feet, was erected.

WINNIPEG.—A stone pavement, 18 feet in width on Main street and 10 feet on York street, was laid around the Post Office, and storage and compression tanks in connection with the water supply were put in, and other improvements effected.

Repairs were made to the Custom House, Examining Warehouse and Post Office, and various other buildings.

(Part I, Appendix No. 2, pages 42 and 43.)

HARBOURS AND RIVERS.

THE RED RIVER.—The sum of \$8,640.75 was expended in continuing the improvement of the river at various points.

THE WHITE MUD.—Several of the bars obstructing the navigation of this river were removed at a cost of \$5,335.29.

(Part I, Appendix No. 3, page 108, and pages 116 to 149.)

NORTH-WEST TERRITORIES.

PUBLIC BUILDINGS.

For construction and repairs there was expended the sum of \$157,960.

CALEDONIA.—The Barracks building has been completed, and a new guard room, containing 12 cells, erected.

The Court House is completed, and is being furnished with a hot-water heating apparatus.

INDIAN HEAD.—The Experimental Farm buildings, described in my report of last year, are completed and occupied.

LETHBRIDGE.—At the Barracks a $1\frac{1}{2}$ -story Hospital building, 44 feet by 30 feet, was erected, and a kitchen wing to same is in course of construction. An addition to the recreation room, 36 by 12 feet, with cellar, was also built, and other improvements effected.

MACLEOD.—The well at the Barracks was deepened and improved and a tank constructed.

MOOSOMIN.—Court House.—On the 18th day of April last a contract was entered into for the construction of this building on Lots 3, 4, 5 and 6, Block 25, and the works are now in progress.

It will consist of a wooden two-story main building, 65 feet by 33 feet, on a stone foundation, and a one-story kitchen, 22 feet by 13 feet, resting on blocks. On the ground floor will be a guard room, a constable's room, two non-commissioned officers' offices, a sheriff's office, a clerk's office, two stairway halls, five cells and two brick vaults, one each for sheriff and clerk; on the first floor will be the court room, and a room each for judge, jury, counsel and witnesses. The basement will contain heating apparatus, fuel, &c.

POLICE BARRACKS, GENERALLY.—Various and numerous repairs and renewals, not elsewhere enumerated in this report, were carried out by police labour at the police posts at Calgary, Fort Macleod, Lethbridge, Maple Creek and Regina, under the superintendence of this Department.

QU'APPELLE.—A portion of the Immigrant shed was fitted up as a court room, and other offices were provided in the building.

REGINA.—At the Barracks, two stables, each 75 feet by 30 feet, with an addition 75 feet by 30 feet for saddle-room, and one stable 50 feet by 28 feet, were erected, and a frame 50 feet high by 28 feet by 28 feet at base, supported on concrete and stonework foundation, to carry the 50,000 gallons of water supply and fire protection tank, was put up. Other works of repair and improvement were also carried out.

An Immigrant shed, 50 feet by 24 feet, was erected and occupied.

The Industrial School, described in my report of last year, has been completed.

On the new residence for the Lieutenant-Governor steady progress has been made.

The drainage and water supply system at the gaol and lunatic asylum have been attended to, and two pairs of cottages for gaol officials are being built.

At the Post Office a well was sunk, a pump put in and a well-house, etc., built.

The riding hall, referred to in my report of last year, has been completed.

WHITEWOOD.—An Immigrant shed, 50 feet by 24 feet, on plan, with an addition for kitchen and latrines, was erected under the supervision of this Department.

Repairs and improvements were effected to the Barracks, old Government House and the Office, REGINA.

Part I. appendix No. 2, pages 44 to 47.)

BRITISH COLUMBIA.

PUBLIC BUILDINGS.

Expenditure on construction and repairs during the year, \$53,206.12.

KAMLOUS.—The Indian Industrial School buildings, described in my report of last year, are completed and occupied.

KIPPEE.—The buildings at this place for the Indian Industrial School have been completed.

NEW WESTMINSTER.—Penitentiary.—The Warden's residence, to which reference was made in last year's report, has been completed and occupied.

VICTORIA.—"C" Battery Barracks.—On the 3rd of February, 1890, a contract was entered into for the construction of the officers' quarters, a 2½-story wooden building on the foundation, 210 feet by 36 feet, exclusive of kitchen wings. It will contain the Commandant's house, a Major's house, a Surgeon's house, a 1st and 2d Lieutenant's house, a mess house, two houses for attached officers and one for a quartermaster.

Repairs alterations and improvements were effected at the Quarantine Station, LEBERT HEAD, Post Office, etc, NANAIMO; Public Building, and old Custom House NEW WESTMINSTER; and at the Custom House and Post Office, VICTORIA.

Part I. Appendix No. 2, pages 47 and 48).

HARBOURS AND RIVERS.

Expenditure on construction and improvements, \$62,543.57.

THE COLUMBIA RIVER.—The navigation of this river has been further improved by the removal of obstructions from the channel below Revelstoke, and by the construction of dams above Golden.

THE COQUITLAM.—The removal of timber jams and other obstructions in the channel has been continued.

THE COWICHAN RIVER.—The work of straightening the channel between the mouth and the Quamichan Indian villages—a distance of about 2 miles—was continued.

ESQUIMALT DRY DOCK.—New keel blocks, hand rails, staunches, etc., were provided and improvements effected by the dock staff.

Two of Her Majesty's ships, the "Icarus" and the "Amphion" (tugs) were overhauled and repaired, as well as seven other steamers.

THE FRASER.—The work of improving the channel across the Sand Heads at the mouth of the river has been continued, a further length of dam being constructed. The channel is being gradually improved, straightened and increased in depth, from the effects of the works carried out by the Department.

The "Samson" was engaged in removing snags between Harrison and the mouth of the river.

NICOL ROCK—Nanaimo Harbour.—During the year the whole area of rock to be removed was broken up, but there remains a large quantity of stone to be raised and removed.

THE SOMAS.—The channel was further improved by the removal of snags and overhanging trees.

VICTORIA HARBOUR.—The removal of the boulder shoal off Shoal Point, referred to in my report of last year, by means of explosives and the dredge, was continued during the year.

(Part 1, Appendix No. 5, pages 109 to 111, and 117 to 149).

DREDGES.

A report on the operations of the various dredges, together with a list of the dredging plant belonging to the Department, will be found in Part 1, Appendix No. 5, pages 112 to 149.

ENGINEERS, ENGINEMEN, FIREMEN AND CARETAKERS.

A list of the various engineers, etc., employed in the Public Buildings throughout the Dominion, with salaries paid them, etc., will be found in Part 1, Appendix No. 3, pages 52 to 54.

DOMINION BUILDINGS.

The amounts expended in connection with heating, lighting and water of the various Public Buildings throughout the Dominion will be found in Part 1, Appendix No. 1, pages 12 to 15.

PUBLIC BUILDINGS, OTTAWA.

The heating, electric lighting, gas, water and bell services of the various Public Buildings in Ottawa were efficiently maintained, ordinary maintenance—only—as a rule, being required. (Appendix No. 4, pages 57 and 58).

SURVEYS AND EXAMINATIONS.

Surveys and examinations were made at 102 places, a list of which will be found in Part 1, Appendix No. 5, page 111.

SLIDES AND BOOMS.

SAGUENAY DISTRICT.

The slide and booms to facilitate the descent of timber from Lake St. John to the River Saguenay are situated on La Petite Décharge, the smaller of the two outlets from the lake to the river. The slide is 5,840 feet long and the booms 1,344 feet.

The Slidemaster's house and other buildings, dams Nos. 2, 3 and 4, as well as 148 feet of slide, were repaired.

(Part 1, Appendix No. 6, page 153).

ST. MAURICE DISTRICT.

The works on the St. Maurice are situated at seven stations, from the mouth of the river to La Tuque Falls, a distance of 100 miles; and there are also two stations on the Vermillion River, a tributary of the St. Maurice.

Although the water was very high no damage was caused thereby to any of the works. Logs are being floated down without much difficulty.

Repairs were effected to the works at the mouth of the river, Cap aux Corneilles, Shawenigan, Grand Mère and Grand Piles.

(Part 1, Appendix No. 7, pages 157 to 159).

OTTAWA DISTRICT.

This district embraces the River Ottawa and its tributaries, the Gatineau, Madawaska, Coulonge, Black, Petewawa and Dumoine Rivers. There are on it eight-three stations, and the works for facilitating the descent of timber aggregate about 1 mile of canal, over 3 miles of slides, nearly 13 miles of booms and over 17,000 lineal feet of dams, with bulkheads, piers, glance piers, etc., in proportion.

During the latter portion of the season of 1889 the waters of the Ottawa and tributaries, which had been at a fair pitch for driving operations, fell to their normal level, but the quantity of timber that did not reach its destination was comparatively small. The foundations of the works, as soon as accessible, were examined during the autumn months, and preparations made for carrying out the necessary works of reconstruction and repair.

There passed through the works 438,907 pieces of timber, 4,500,518 saw-logs and 2 cribs of sawn lumber, the revenue accruing on the above amounting to \$96,542.97.

A description of work done at the different stations on the main river and its tributaries will be found in Part 1, Appendix No. 8, pages 163 to 165.

NEWCASTLE DISTRICT.

The works in this district are of two classes: those connected with navigation, which are under the control of the Department of Railways and Canals, and those constructed to facilitate the descent of timber down the River Trent and its tributaries, which are under the control of this Department.

There was a good flow of water during the whole season, though the latter part was very dry, and the extra water retained in Clear, Stoney and Buckhorn Lakes proved of great service.

The works suffered no damage, further than that caused by ordinary wear and tear, and a description of the work executed will be found in Part 1, Appendix No. 9, pages 169 to 171.

STAFF EMPLOYED ON SLIDES AND BOOMS.

A list of the staff employed on the different slides and booms, with date of appointment, salary, etc., will be found in Part 1, Appendix No. 10, pages 174 to 176b.

COLLECTION OF SLIDE AND BOOM DUES.

This service was transferred to this Department by Act 52 Vic., chap. 19, and the report of the Collector for the Ottawa District, with statements of dues accrued, dues outstanding uncollected, etc., will be found in Part 1, Appendix No. 11, pages 179 to 186.

ROADS AND BRIDGES.

BATTLE RIVER BRIDGE, BATTLEFORD.—This bridge, which has been in course of construction for the past two years, was completed by the Department. (Part 1, Appendix No. 5, page 108).

BELLY RIVER BRIDGE—Lethbridge.—A contract having been made for the construction of this bridge, work was commenced in October, 1889, and was well advanced at the close of the fiscal year. (Part 1, Appendix No. 5, page 108).

CHAUDIÈRE BRIDGE, Ottawa.—The reconstruction of this bridge across the Ottawa was completed about the end of December, 1889. Its extreme length is 236 feet, and the span between the abutments 229 feet in the clear. The roadway is 30 feet clear width, with two footpaths of 5 feet wide each. (Part 1, Appendix No. 5, page 102).

TELEGRAPHS.

The various lines owned and operated by or on behalf of the Government were maintained during the year.

The "Newfield" was engaged in November, 1889, in laying the cables connecting Brier and Long Islands with the town of Digby, N.S. A half knot of new cable was laid between Grindstone and Allright Islands, of the Magdalen Group, and a cable is being laid between Meat Cove Station and St. Paul's Island to take the place of the Bird Rock Cable, which has been abandoned. On the north shore of the St. Lawrence the line has been completed to Point aux Esquimaux. In British Columbia, a line

from Victoria to Cape Beale has been nearly completed, and the line between Ashcroft and Barkerville is being re-poled. Full details regarding the Telegraph Service, will be found in the report of the Superintendent of Government Telegraph Service in Part 1, Appendix No. 12, pages 189 to 212.

OPENING AND CLOSING OF NAVIGATION.

Part 1, Appendix No. 13, page 215, gives a statement of the dates of the closing of navigation in the winter of 1888, and of the opening in 1889, at the principal ports of Canada.

CONTRACTS, PROPERTY PURCHASED, &c.

Part 1, Appendix No 14, pages 219 to 225, contains statements of the contracts entered into by the Department, of property purchased by the Department, and of property leased by or to the Department, during the fiscal year.

ACTS RELATING TO PUBLIC WORKS.

Part 1, Appendix No. 15, page 229, contains a list of some of the Public Acts of the Parliament of Canada passed at the Session of 1890, and having reference to the Public Works Department, or works under its charge.

NATIONAL ART GALLERY.

Three oil paintings and one water colour have been added to the collection.

The number of visitors is largely in excess of that of the previous year. (Part 1, Appendix No. 16, page 233).

OFFICIAL CORRESPONDENCE.

Part 1, Appendix No. 17, pages 237 and 238, contains a statement of the official correspondence of the Department from 1867 to 30th June, 1890, as well as that of the principal officers of the Department.

GRAVING DOCKS.

There are at present three graving, or dry docks, opened for the reception and repairs of ocean-going steamers and vessels, viz., at Halifax, Nova Scotia; Levis, Quebec; and Esquimalt, British Columbia, while a fourth, to accommodate vessels engaged in the lake trade, is approaching completion at Kingston, Ontario. Their dimensions are as follows:—

ESQUIMALT (Built by the Dominion.):

	Feet.
Length.....	430
Width at bottom.....	41
do coping level	90
do entrance	65
Depth of high water on sill at high water ordinary springs....	26½
(Spring tides rise 7 to 10 feet, neaps 5 to 8 feet.)	

KINGSTON (Under construction by the Dominion.).

When completed, this dock will be of the following dimensions:—

	Feet.
Length on the floor.....	280
Width do	47
Width at coping level.....	79
Depth from coping to floor.....	26
Depth of water on sill at low water.....	15½
Width of entrance.....	55

(The level of Lake Ontario has a range of 3½ feet.)

LEVIS (Built by the Harbour Commission of Quebec and assumed by the Dominion.):

	Feet.
Length	495
Width at coping level	100
do bottom.....	73
do entrance.....	62
Depth of water on sill at high water ordinary spring tides....	25½
do do neap tides.....	20½

HALIFAX (Built by the Halifax Graving Dock Co., Limited, of England. Subsidized by the Dominion under Act 45, Vic., chap. 17; by the Imperial Government and the City of Halifax.):

	Feet.
Length	585
Width at coping level.....	102
do bottom.....	72
do entrance.....	89½
Depth of water on sill at ordinary spring tides	30
(Spring tides rise 6 feet, neaps 3 feet.)	

The question of the improvement of the harbour of Montreal to give additional accommodation for the increasing traffic, as well as to guard against the flooding of the lower portions of the city, having been brought prominently before the public, the report of the Commission appointed in 1886 to enquire into the causes of the periodical inundations which have caused so much damage and inconvenience, has been printed, and forms Part II of the appendices attached to this report.

HECTOR L. LANGEVIN,

Minister of Public Works.

Ottawa, December, 1890.

APPENDICES.

PART I.

APPENDIX No. 1.

STATEMENT OF EXPENDITURE

DURING FISCAL YEAR ENDED 30TH JUNE, 1890,

BY

O. DIONNE, ACCOUNTANT.

(Reference No. 112,340.)

APPENDIX No. 1.

STATEMENT showing the Amount expended by the Department of Public Works,
Dominion of Canada, during Fiscal Year ended 30th June, 1890.

Name of Work.	Con- struction and Im- provements.	Repairs.	Staff and Main- tenance.	Total.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.
PUBLIC BUILDINGS.				
GENERALLY			14,481 83	14,481 83
<i>Nova Scotia.</i>				
Amherst Post Office, &c		32 09		32 09
Annapolis do	9,934 24			9,934 24
Antigonish do		240 56		240 56
Halifax Dominion Building	850 00	1,507 68		2,357 68
do Examining Warehouse		1,576 86		1,576 86
do Immigrant Building	4,919 72			4,919 72
do Penitentiary		0 24		0 24
Nappan Experimental Farm	4,897 94			4,897 94
New Glasgow Post Office, &c		390 34		390 34
North Sydney do		9 45		9 45
Pictou do		371 42		371 42
Point Edward (Sydney) Quarantine Hospital		21 00		21 00
Sydney (South) Marine Hospital		15 70		15 70
do Post Office, &c	12,380 38			12,380 38
Truro Post Office, &c		73 75		73 75
Windsor do		6 00		6 00
Yarmouth do		148 17		148 17
<i>Prince Edward Island.</i>				
Charlottetown Dominion Building	888 64	65 20		953 84
Montague Post Office, &c		87 27		87 27
Summerside do	608 00			608 00
<i>New Brunswick.</i>				
Bathurst Post Office, &c	252 53	118 10		370 63
Carleton (St. John) Post Office		17 24		17 24
Dalhousie Post Office, &c	10,366 61			10,366 61
Fredericton do		732 01		732 01
Munton do		590 20		590 20
Newcastle do		242 78		242 78
Partridge Island Quarantine Station		300 00		300 00
Portland Post Office		133 15		133 15
St. John Custom House		608 76		608 76
do Marine Hospital		42 68		42 68
do Penitentiary		360 41		360 41
do Post Office		500 10		500 10
do Savings Bank		52 49		52 49
St. Stephen's Post Office, &c		134 55		134 55
Sussex do	172 35			172 35
Woodstock do	1,047 72			1,047 72
Carried forward	46,318 13	8,378 20	14,481 83	69,178 16

APPENDIX No. 1—Continued.

Name of Work.	Con- struction and Im- provements.	Repairs.	Staff and Main- tenance.	Total.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.
PUBLIC BUILDINGS—Continued.				
<i>Quebec.</i>				
Brought forward.....	46,318 13	8,378 20	14,481 83	69,178 16
Aylmer Post Office, &c.	5,998 78	.....	.....	5,998 78
Carillon Inland Revenue Office.	435 00	.....	.....	435 00
Chicoutimi Marine Hospital.....	644 22	450 05	.....	1,094 27
Coaticook Post Office, &c.	4,910 69	.....	.....	4,910 69
Grosse Ile Quarantine Station.....	.....	532 19	.....	532 19
Hull Post Office, &c.	681 55	298 75	.....	980 30
Joliette do	8,187 04	.....	.....	8,187 04
Lachine do	1,610 96	.....	.....	1,610 96
Montreal Custom House.....	4,015 00	370 68	.....	4,385 68
do Drill Hall	1,743 68	.....	.....	1,743 68
do Examining Warehouse.....	3,366 14	114 43	.....	3,480 57
do Inland Revenue Building.....	.....	74 90	.....	74 90
do Lachine Canal Office.....	.....	61 75	.....	61 75
do Post Office.....	1,627 78	2,086 01	.....	3,713 79
Quebec Citadel Buildings.....	3,107 37	2,444 41	.....	5,551 78
do do "Cliff"	373 56	.....	.....	373 56
do Clerk of Works Office.....	.....	869 00	.....	869 00
do Cullers' Office.....	.....	7 11	.....	7 11
do Custom House.....	.....	2,309 09	.....	2,309 09
do Drill Hall.....	100 00	.....	.....	100 00
do Examining Warehouse.....	1,382 73	184 00	.....	1,566 73
do Immigrant Building.....	.....	143 07	.....	143 07
do Inland Revenue Office.....	.....	27 17	.....	27 17
do Marine Hospital.....	.....	805 98	.....	805 98
do Old Parliament Building, site.....	.....	176 25	.....	176 25
do Post Office.....	.....	1,800 37	.....	1,800 37
do Weights and Measures Office.....	.....	7 00	.....	7 00
Riviere du Loup (Fraserville), Post Office, &c.	477 86	.....	.....	477 86
Sherbrooke Post Office, &c.	400 07	324 54	.....	724 61
Sorel do .....	.....	31 50	.....	31 50
St. Henri Post Office.....	3,604 20	.....	.....	3,604 20
St. Hyacinthe Post Office, &c.	2,699 07	.....	.....	2,699 07
St. Jerome do	7,829 88	.....	.....	7,829 88
St. John's Post Office.....	.....	224 10	.....	224 10
St. Vincent de Paul Penitentiary.....	40,852 26	.....	.....	40,852 26
Three Rivers Custom House.....	.....	480 35	.....	480 35
do Post Office.....	.....	111 69	.....	111 69
<i>Ontario.</i>				
Almonte Post Office, &c.	7,063 00	.....	.....	7,063 00
Amherstburg do .....	.....	50 10	.....	50 10
Barrie do .....	.....	92 65	.....	92 65
Belleville Drill Shed.....	10,000 00	.....	.....	10,000 00
do Post Office, &c.	418 63	94 78	.....	513 41
Berlin do	116 95	70 35	.....	187 30
Brampton do	12,828 33	.....	.....	12,828 33
Brantford Drill Shed.....	152 40	.....	.....	152 40
do Post Office, &c. ....	.....	57 35	.....	57 35
Brockville do .....	.....	255 39	.....	255 39
Carleton Place do	4,039 80	.....	.....	4,039 80
Cayuga do	3,395 67	2 35	.....	3,398 02
Chatham do .....	.....	216 92	.....	216 92
Cobourg do	5,960 81	8 50	.....	5,969 31
Cornwall do .....	.....	96 25	.....	96 25
Carried forward.....	184,341 56	23,257 23	14,481 83	222,080 62

APPENDIX No. 1—Continued.

Name of Work.	Con- struction and Im- provements.	Repairs.	Staff and Main- tenance.	Total.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.
PUBLIC BUILDINGS—Continued.				
<i>Ontario—Continued.</i>				
Brought forward	184,341 56	23,257 23	14,481 83	222,080 62
Dundas Post Office, &c.....		554 50		554 50
Galt do		27 15		27 15
Gananoque do	2,622 66	414 00		3,036 66
Goderich do	7,022 01			7,022 01
Geolph do	2,267 98	11 50		2,279 48
Hamilton Drill Shed	182 70	167 25		349 95
do Post Office, &c.....	2,662 05	146 00		2,808 05
Kingston Civil Service Examination Office.....		10 35		10 35
do Custom House		430 70		430 70
do Inland Revenue Office.....		30 00		30 00
do Military College.....		13 28		13 28
do Penitentiary.....	18,024 93			18,024 93
do Post Office.....		480 88		480 88
Lindsay do	12,482 03	14 00		12,496 03
London Custom House	2,923 40	2 50		2,925 90
do Infantry School.....	7,869 21			7,869 21
do Post Office.....	388 88			388 88
Napanee do	16,284 26			16,284 26
Niagara Falls Post Office.....		44 00		44 00
Orangeville do		133 21		133 21
Ottawa Examining Warehouse.....		850 00		850 00
do Experimental Farm	13,847 65			13,847 65
do Geological Museum.....		1,394 34		1,394 34
do do gas and electric lighting.....			543 00	543 00
do Government Printing Bureau.....	34,766 48	60 00		34,766 48
do do gas and electric lighting.....			2,119 35	2,119 35
do National Art Gallery.....			716 93	716 93
do Post Office.....		345 76		345 76
do do gas and electric lighting.....			1,980 20	1,980 20
do Public Buildings.....		145,542 40		145,542 40
do do East Block, new vault.....	36,060 50			36,060 50
do do Langevin Block.....	96,663 32			96,663 32
do do Parliament Building, sky- light and copper roofing.....	6,040 13			6,040 13
do do Western Block, elevator.....	1,275 00			1,275 00
do do Gas and Electric Light- ing..... \$ 18,479 30				18,479 30
do do Gas & Electric Lighting (Langevin Block)..... 1,161 60				1,161 60
do do Grounds.....			19,640 90	19,640 90
do do Heating.....			6,725 44	6,725 44
do do Major's Hill Park.....	1,415 00		61,889 99	61,889 99
do do Removal of snow.....			5,017 50	5,017 50
do do Telephone service.....			1,286 00	1,286 00
do do Water.....			3,021 95	3,021 95
do Supreme Court.....			15,123 93	15,123 93
do Victoria Hall.....		394 51		394 51
Pembroke Post Office, &c.....	470 05	364 10		834 15
Peterborough Custom House, &c.....	11,970 30			11,970 30
do Post Office.....	2,013 05			2,013 05
Port Arthur Immigrant Building.....	1,953 25	4 42		1,957 67
do Post Office.....		72 00		72 00
Port Colborne do	94 00			94 00
		123 29		123 29
Carried forward.....	463,531 40	174,887 37	132,547 02	770,965 79

APPENDIX No. 1—Continued.

Name of Work.	Con- struction and Im- provements.	Repairs.	Staff and Main- tenance.	Total.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.
PUBLIC BUILDINGS—Continued.				
<i>Ontario—Concluded.</i>				
Brought forward.....	463,531 40	174,887 37	132,547 02	770,965 79
Port Hope Post Office, &c.....		97 15		97 15
Prescott Post Office, &c.....	11,494 66			11,494 66
Rideau Hall.....		18,007 41		18,007 41
do Allowance for fuel and light.....			8,000 00	8,000 00
do Electric lighting.....			200 00	200 00
do Removal of snow.....			509 65	509 65
St. Catharines Post Office, &c.....	12 52	228 97		241 49
St. Thomas do.....	1,508 03	633 37		2,141 40
Stratford do.....	3,150 55	416 00		3,566 55
Strathroy do.....	11,402 98			11,402 98
Toronto Civil Service Examination Office.....		61 75		61 75
do Custom House.....		110 81		110 81
do Examining Warehouse.....	152 15	378 71		530 86
do do do Water Lots.....	34,955 55			34,955 55
do Immigrant Building.....	1,064 85			1,064 85
do Post Office.....	5,086 64	983 06		6,069 70
Trenton Post Office, &c.....	12,440 97	2 50		12,443 47
Walkerton do.....	1,609 84			1,609 84
Windsor do.....	190 92	5 05		195 97
<i>Manitoba.</i>				
Brandon Experimental Farm.....	2,772 29			2,772 29
do Post Office.....	18,943 55			18,943 55
St. Paul's Industrial School.....	15,586 70			15,586 70
Stony Mountain Penitentiary.....	18,999 61			18,999 61
Winnipeg Clerk of Works Office.....		1,540 82		1,540 82
do Custom House.....		23 68		23 68
do Dominion Lands Office.....		283 33		283 33
do Examining Warehouse.....		113 71		113 71
do Immigrant Shed.....		300 00		300 00
do Post Office.....	2,512 38	92 25		2,604 63
<i>North-West Territories.</i>				
Banff Mounted Police Barracks.....	574 55			574 55
Battleford do.....	2,580 92			2,580 92
Calgary Clerk of Works Office.....		218 65		218 65
do Court House, Gaol, Registry Office, &c.....	19,626 37			19,626 37
do Mines Office.....		91 10		91 10
do Mounted Police Barracks.....	10,377 87			10,377 87
Edmonton do do.....	67 00			67 00
Fort MacLeod Custom House.....	624 42			624 42
do Mounted Police Barracks.....	4,527 35			4,527 35
Indian Head Experimental Farm.....	8,908 28			8,908 28
Lethbridge Mounted Police Barracks.....	2,945 01			2,945 01
Maple Creek do do.....	442 53			442 53
Medicine Hat Hospital—Government grant.....	2,000 00			2,000 00
do Mounted Police Barracks.....		27 18		27 18
Carried forward.....	658,089 89	198,502 87	141,256 67	997,849 43

APPENDIX No. 1—Continued.

Name of Work.	Construction and Im- provements.	Repairs.	Staff and Main- tenance.	Total.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.
PUBLIC BUILDINGS—Continued.				
<i>North-West Territories—Concluded.</i>				
Brought forward.....	658,089 89	198,502 87	141,256 67	997,849 43
Moosemin Court House, Lock-up, &c.....	3,306 99			3,306 99
do Sheriff's Office.....		305 00		305 00
Prince Albert Court House.....		532 22		532 22
do Mounted Police Barracks.....	875 67			875 67
Public Buildings Generally.....			3,161 84	3,161 84
Qu'Appelle Industrial School.....		10 05		10 05
do Mounted Police Barracks.....		35 00		35 00
Regina Clerk of Works Office.....		472 05		472 05
do Court House and Gaol—Water supply, &c.....	6,759 80	154 52		6,914 32
do Gaol—Cottages for officers.....	4,154 14	70 93		4,225 07
do Immigration Building.....	837 00	36 93		873 93
do Industrial School.....	33,316 84			33,316 84
do Lieutenant Governor's residence (new).....	20,682 40			20,682 40
do do do (old).....		4,185 24		4,185 24
do Mounted Police Barracks.....	12,884 48			12,884 48
do North-West Assembly Building.....	175 09			175 09
do Post Office.....	1,073 56	15 67		1,089 23
do Riding Hall.....	10,285 89			10,285 89
Saskatchewan Mounted Police Barracks.....	4,365 05			4,365 05
St. Albert do do.....		116 50		116 50
Whitewood Immigration Building.....	780 00			780 00
Wood Mountain Mounted Police Barracks.....		294 35		294 35
<i>British Columbia.</i>				
Agassiz Experimental Farm.....	145 27			145 27
Kamloops Industrial School.....	9,317 75			9,317 75
Kuper do.....	5,653 56			5,653 56
Nanaimo Post Office.....		954 50		954 50
New Westminster old Custom House.....		50 00		50 00
do Penitentiary.....	14,712 97			14,712 97
do Post Office.....		46 30		46 30
Vancouver Post Office.....		107 80		107 80
Victoria Military Barracks.....	21,092 46			21,092 46
do Custom House.....		608 56		608 56
do Post Office.....		386 05		386 05
do Quarantine Station.....		130 90		130 90
Carried forward.....	808,508 81	207,015 44	144,418 51	1,159,942 76

APPENDIX No. 1—*Continued.*

Name of Work.	Con- struction and Im- provements.		Repairs.	Staff and Main- tenance.	Total.	
PUBLIC BUILDINGS—Continued.						
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	
Brought forward.....	808,508 81	207,015 44	144,418 51	1,159,942 76		
	Salaries of Engineers, &c.	Supplies for En- gineers, &c.	Heating.	Lighting.	Water.	Total.
EXPENDITURE ON ACCOUNT SERVICES MENTIONED.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Ottawa.						
Langevin Block.....	3,924 92					3,924 92
Nova Scotia.						
Amherst Post Office.....	400 00	24 83	223 18	229 60		877 61
Antigonish do	131 40	5 50	72 24			209 14
Arichat do	17 00		94 50			111 50
Baddeck do	200 00		100 00	12 88		312 88
Halifax Dominion Build- ing.....	2,067 96	12 10	711 13	2,318 70	650 00	5,759 89
Halifax Examining Ware- house.....	500 00	17 35	165 41	54 20	186 95	923 91
New Glasgow Post Office.....	409 89	51 18	148 00	241 20	100 00	950 27
North Sydney do ..	466 64	16 55	150 00	18 20		651 39
Pictou Custom House.....	400 00	0 70	129 65			530 35
do Marine Hospital.....			90 93			90 93
Truro Post Office.....	400 00	13 15	105 00	240 17	20 00	778 32
Windsor do	400 00	10 00	172 29	122 70	50 00	754 99
Yarmouth Post Office, &c.	400 00	16 11	195 00	481 52	72 00	1,164 63
Prince Edward Island.						
Charlottetown Dominion Building	1,579 96	72 39	490 08	1,177 50	290 25	3,610 18
Montague Post Office	120 00	29 39	60 00	25 11		234 50
Summerside do	460 00	17 10	216 29	42 59		675 98
New Brunswick.						
Bathurst Post Office, &c..	400 00	4 60	348 80	52 33		805 73
Carleton, St. John, Post Office, &c.....	75 00			153 63	20 00	248 63
Chatham Post Office, &c..	146 80	12 73	124 22	71 82		355 57
Fredericton do	400 00		319 40	419 85	33 00	1,172 25
Moncton do ..	400 00	29 88	188 38	607 55	100 50	1,326 31
Newcastle Post Office	400 00	20 39	369 83	250 80		1,041 02
Portland do			31 13	25 57		56 70
St. John Custom House.....	1,990 60	91 50	1,426 83	129 12	766 47	4,404 52
do Marine Hospital.....		2 01	510 57	239 88	56 91	809 37
do Penitentiary.....	450 00		49 60	6 25		505 85
do Post Office.....	1,006 68	36 00	543 65	2,201 51	516 56	4,304 40
do Savings Bank.....		3 72	247 18	94 86	17 50	363 26
St. Stephen's Post Office, &c	400 00	6 20	161 88	515 40	86 25	1,169 73
Sussex do do ..	400 00	7 02	136 09	10 79		553 90
Woodstock do do ..	399 96	3 50	223 60	141 16	34 00	802 22
Carried forward....	18,286 81	503 90	7,804 86	9,884 89	3,000 39	39,480 85
						1,159,942 76

APPENDIX No. 1.—Continued.

Name of Work.	Construction and Improvements.	Repairs.	Staff and Maintenance.	Total.		
		\$ cts.	\$ cts.	\$ cts.		
PUBLIC BUILDINGS—Continued		\$ cts.	\$ cts.	\$ cts.		
Brought forward.....		808,508 81	207,015 44	144,418 51		
				1,159,942 76		
EXPENDITURE ON ACCOUNT SERVICES MENTIONED.—Continued.	Salaries of Engineers, &c.	Supplies for Engineers, &c.	Heating.	Lighting.	Water.	Total.
Brought forward...	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Quebec.						
Aylmer Post Office.....	66 70	11 25	210 60	32 67		320 62
Caticook do	304 40	33 81	248 16	60 89	16 67	663 93
Hull Post Office, &c.	200 00		246 50	36 16	135 60	617 66
Joliette Post Office, &c.	283 10	31 15	380 31	33 25	108 34	836 15
Montreal Custom House.....	1,499 00		923 93	540 35	375 35	3,329 63
do Drill Hall.....	540 00					540 00
do Examining Warehouse ..	1,485 00	3 00	1,919 90	534 85	565 63	4,508 28
do Inland Revenue Office ..	260 00		272 18	204 45	98 90	835 53
do Post Office, St. James st.	840 00	3 95	1,010 10	3,857 10	1,697 33	7,408 48
do do Notre Dame street ..				22 00		22 00
do do St. Catherine's street ..				27 20		27 20
do do St. Lawrence street ..				32 50		32 50
Quebec Citadel Buildings.	75 25		183 60	158 76		417 61
do Caller's Office ..	540 00		22 50			562 50
do Custom House.....	585 00	4 10	702 75	29 56	30 00	1,351 41
do Examining Warehouse ..	1,140 00	140 50	876 34	41 40		2,198 73
do Marine Hospital..			1,401 25			1,401 25
do Observatory ..					44 00	44 00
do Post Office ..			371 25	1,048 14		1,419 39
Sharnbrook Post Office, &c	400 00	19 26	284 25	560 25	62 00	1,323 76
Sural do ..	400 00	31 35	269 00	239 20	250 00	1,189 55
St. Jérôme do ..	312 28	28 35	394 48	40 00		775 11
St. John's do ..	350 00		147 00	125 00	40 00	652 00
St. Vincent de Paul Penitentiary.....	110 31		1,750 00			1,860 31
Three Rivers Custom House	700 00	8 80	374 70		72 76	1,156 26
do Post Office ..	400 00	23 45	212 64	221 20	60 00	947 29
Ontario.						
Amherstburg Post Office, &c ..	400 00	64 67	224 93	96 14		785 74
Barrie do ..	400 00		261 50	254 20	50 00	965 70
Belleville do ..	600 00	20 90	431 75	496 73	35 25	1,574 66
Berlin do ..	400 00	3 75	239 20	169 50	11 00	823 45
Brampton do ..	19 30	1 50	17 25			38 05
Brantford do ..	600 00	27 83	289 33	280 60		1,297 16
Brockville do ..	400 00		267 75	571 90	170 00	1,348 95
Cayuga do ..	47 85	16 31	143 75	25 25		233 16
Chatham do ..	850 00	9 00	258 32	314 60		1,431 92
Carried forward.	32,486 00	987 32	22,079 48	19,037 47	6,822 52	82,312 79

APPENDIX No. 1—Continued.

Name of Work.	Con- struction and Im- provements.	Repairs.	Staff and Main- tenance.	Total.
PUBLIC BUILDINGS—Continued.				
	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Brought forward.....	808,568 81	207,015 44	144,418 51	1,159,942 76
EXPENDITURE ON ACCOUNT SERVICES MENTIONED—Con.				
Ontario—Concluded.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Brought forward..	32,486 00	987 32	22,079 42	19,937 47
Clifton Post Office, &c..	400 00	15 70	382 00	85 18
Cobourg do	216 66			120 60
Cornwall do	373 80	3 65	275 20	616 51
Dundas do			30 25	95 62
Galt do	400 00		202 58	174 40
Gananoque Custom House			150 00	
do Post Office....	100 00		102 00	
Guelph do	433 35	3 60	241 32	285 60
Hamilton Custom House	600 00			133 31
do Drill Shed....	315 00		6 00	
do Post Office....	825 00	8 00	948 40	1,532 49
Kingston Canal Tolls Office				9 00
Kingston Custom House	40 00		619 48	93 20
do Inland Revenue				69 20
do Military College	1,440 00	45 80		23 40
do Post Office....			357 10	53 52
Lindsay do	349 00	61 86	334 94	32 01
London Custom House....	1,080 00	15 70	649 73	296 45
do Post Office....	600 00	20 95	503 11	579 20
Napanee do	250 00	14 10	306 09	26 60
Orangeville do	400 00	72 04	131 79	154 84
Ottawa Experimental F'm.	205 00		520 04	
Peterborough Post Office..	400 00		172 28	310 80
Port Arthur do			14 50	
do Colborne do	210 00	16 74	116 25	85 55
do Hope do	400 00	17 70	227 00	183 60
Prescott do		2 00	86 75	
Stratford do &c..	600 00	6 00	246 57	382 40
St. Catharines do	400 00	9 75	250 33	178 20
St. Thomas do	400 00	12 60	357 70	482 66
Trenton do	333 30	13 65	282 50	52 00
Toronto Custom House....	625 00	6 00	503 64	122 29
do Examining Ware- house.....	3,711 00	156 39	989 53	38 76
do Inland Revenue Office.....	676 50	6 00	325 68	351 48
do Post Office.....	1,947 81	9 87	707 19	3,012 87
Windsor do	1,000 00	4 25	519 56	662 73
Wolfe Island Post Office.			31 80	
Manitoba.				
Brandon Experimental Farm.....			55 00	
Winnipeg Custom House do Dominion Lands Office.....			785 45	253 20
			325 30	11 64
Carried forward.....	51,257 42	1,509 67	33,906 94	30,783 06
				11,121 91
				128,579 00
				1,159,942 76

APPENDIX No. 1—Continued.

Name of Work.	Construction and Improvements.	Repairs.	Staff and Maintenance.	Total.		
PUBLIC BUILDINGS—Concluded.	\$ cts.	\$ cts.	\$ cts.	\$ cts.		
Brought forward.....	808,508 81	207,015 44	144,418 51	1,159,942 76		
EXPENDITURE ON ACCOUNT SERVICES MENTIONED—Con.						
	Salaries of Engineers, &c.	Supplies for Engineers, &c.	Heating.	Lighting.	Water.	Total.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Manitoba—Concluded.						
Brought forward...	51,257 42	1,509 67	33,906 94	30,783 06	11,121 91	128,579 00
Winnipeg Examining Warehouse...			527 75	15 12		542 87
do Immigrant Shed			56 70			56 70
do Indian Office			189 09			189 09
do Post Office...	2,873 75	41 41	2,971 50	927 54	687 50	7,501 70
North-West Territories.						
Calgary Barracks				675 00		675 00
do Mines Office			100 30			100 30
Indian Head Experimental Farm			158 90			158 90
Ft. McLeod Custom House			190 90			190 90
Prince Albert Court do	400 00	14 90	75 00	38 20		528 10
Regina Office			56 80			56 80
do Court House		22 50	584 80	9 12	23 23	639 65
do Gaol and Lunatic Asylum			102 00			102 00
do Post Office		8 50	312 20			320 70
British Columbia.						
Nanaimo Post Office	600 00		95 00	167 40	36 00	898 40
New Westminster Post Office	600 00		148 75	150 00	40 00	938 75
Victoria Post Office			244 75	937 35	18 57	1,200 67
do Custom House			156 75	32 00	36 81	225 56
DOMINION BUILDINGS GENERALLY.			781 49		3 00	784 49
Totals	55,731 17	1,596 98	40,659 53	33,734 79	11,967 02	143,689 49
Carried forward...						
			808,508 81	207,015 44	144,418 00	1,303,632 25

APPENDIX No. 1.—Continued.

Name of Work.	Con- struction and Improve- ments.	Repairs.	Staff and Main- tenance.	Total.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Brought forward.....	808,508 81	207,015 44	288,108 00	1,303,632 25
HARBOURS AND RIVERS.				
GENERALLY.....			8,806 51	8,806 51
<i>Nova Scotia.</i>				
Arisaig Pier—Extension.....	4,899 75			4,899 75
Barrington Passage Pier.....	1,220 85			1,220 85
Big Lorraine Harbour.....	500 00			500 00
Big Tracadie Harbour—Dredging.....	1,000 00			1,000 00
Cheticamp Wharf.....	961 20			961 20
Church Point Breakwater.....		32 69		32 69
Cow Bay Breakwater.....		3,500 00		3,500 00
Digby Pier.....		392 91		392 91
East Bay (north side) Wharf.....	1,999 87			1,999 87
East River of Pictou.....	500 00			500 00
Eatonville Wharf.....	2,100 03			2,100 03
Economy Breakwater.....	2,520 52			2,520 52
French Cove Harbour.....	199 98			199 98
Grosses Coques Breakwater (renewal).....	2,999 97			2,999 97
Halifax Graving Dock.....		100 20		100 20
Jones' Harbour.....	997 99			997 99
Lismore Wharf.....	100 00			100 00
Mabou Harbour.....	1,000 00			1,000 00
Margaree Pier—Extension.....	2,471 21			2,471 21
McNair's Cove.....		850 00		850 00
Negro Island—Beach protection work.....	403 36			403 36
Partridge Island River.....	2,049 71			2,049 71
Port George Breakwater—Re-building.....	4,647 30			4,647 30
Port Greville Harbour.....	2,499 99			2,499 99
Port Hood Pier.....	2,499 98			2,499 98
Port Maitland or "Green Cove" Breakwater.....		270 98		270 98
Port Medway—Beach protection work.....		199 99		199 99
Round Bay—Repairing protection walls.....		80 00		80 00
Sheet Harbour Ballast Wharf.....	505 00			505 00
Summersville Breakwater.....		2,477 64		2,477 64
Three Fathom Harbour.....		249 90		249 90
Tidnish.....		53 92		53 92
Two Rivers.....		150 02		150 02
Wallace Harbour.....	2,578 41			2,578 41
West Jordan Bay—Dredging.....	1,199 95			1,199 95
Western Head.....	4,999 98			4,999 98
<i>Prince Edward Island.</i>				
Annandale Pier.....		275 21		275 21
Belfast Pier.....		644 67		644 67
Vascompec Harbour.....	2,000 00			2,000 00
Wapel Point Wharf, Grand River.....	907 94			907 94
na Point Pier.....	798 71			798 71
ey's Pier.....		500 00		500 00
's Shore Pier.....		100 00		100 00
ort Pier.....		399 84		399 84
Bransque Breakwater.....		1,000 00		1,000 00
tague—Steven's Pier.....		199 98		199 98
Wimladon Breakwater.....		846 78		846 78
do Dominice.....		99 99		99 99
Office.....				
Carried forward.....	857,070 51	219,440 16	296,914 51	1,373,425 18

APPENDIX No. 1—Continued.

Name of Work.	Con- struction and Improve- ments.	Repairs.	Staff and Main- tenance.	Total.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Brought forward.....	857,070 51	219,440 16	296,914 51	1,373,425 18
HARBOURS AND RIVERS—Continued.				
<i>Prince Edward Island—Concluded.</i>				
Pinette Pier.....		250 00		250 00
Port Selkirk Pier.....		987 52		987 52
Pownal Pier.....		99 95		99 95
Souris East—Knight's Point Pier.....		1,299 91		1,299 91
South River Pier.....		146 50		146 50
St. Mary's Bay Pier.....		160 56		160 56
<i>New Brunswick.</i>				
Campbellton Ballast Wharf.....	6,835 96			6,835 96
Cape Tormentine Harbour..	44,471 02			44,471 02
Edgett's Landing Pier.....	3,024 08			3,024 08
Grande Anse Breakwater.....		2,260 51		2,260 51
Kingston Wharf, on Richibucto River.....	129 33			129 33
Lincoln Wharf.....	999 62			999 62
Maisonette Wharf.....	1,442 50			1,442 50
Misase Pier.....		436 88		436 88
Quaco Breakwater.....		557 57		557 57
Richibucto Harbour.....	899 42			899 42
River St. John:—				
Above Grand Falls.....	\$1,000 13			
Between do and River Tobique.....	799 97			
do do St. Francis River.....	698 50			
Improvement of channel at Bear Island.....	1,446 70			
	3,945 30			3,945 30
Removal of snags.....		250 00		250 00
Shippagan Breakwater.....	4,618 61			4,618 61
St. John Harbour—Negro Point Breakwater.....	1,185 78			1,185 78
St. Louis Wharf.....	177 50			177 50
Upper Salmon River Breakwater.....		259 97		259 97
HARBOURS GENERALLY, MARITIME PROVINCES.			15,454 52	15,454 52
<i>Quebec.</i>				
Agnes Pier, Lake Mégantic.....		209 68		209 68
Anse à l'Eau, or Tadoussac.....	1,200 91			1,200 91
Ragotville (St. Alphonse) Pier.....		809 27		809 27
Baie St. Paul Wharf.....	2,064 58			2,064 58
do Isolated Block.....		595 95		595 95
Beauport Pier.....	200 00			200 00
Belzil Piers and Booms.....		82 00		82 00
Berthier (en bas) Pier.....		410 66		410 66
Boucherville Pier.....	20 85			20 85
Cap à l'Aigle Pier.....		83 17		83 17
Cap de la Magdeleine Pier.....	1,000 00			1,000 00
Cap Santé Pier.....	500 85			500 85
Chenal de Moine—Sts. Anne de Sorel Ice Piers.....	2,497 11			2,497 11
Chicoutimi Pier.....		1,005 81		1,005 81
Coteau Landing Pier (re-construction). ..	2,592 91			2,592 91
Flint Pier, Lake Mégantic.....		156 26		156 26
Georgeville Pier.....	1,995 27			1,995 27
Gatineau Point Wharf.....		584 01		584 01
Carried forward.....	936,872 11	229,754 34	312,701 03	1,479,327 48

APPENDIX No. 1—Continued.

Name of Work.	Con- struction and Improve- ments.	Repairs.	Staff and Main- tenance.	Total.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Brought forward.....	936,872 11	229,754 34	312,701 03	1,479,327 48
HARBOURS AND RIVERS—Continued.				
<i>Quebec—Concluded.</i>				
Grand Pabos Harbour, removal of rocks	2,906 95			2,906 95
Grande Rivière.....	7,640 54			7,640 54
Harbours, &c., generally.....			9,856 55	9,856 55
Kamouraska Wharf.....	2,855 99			2,855 99
Ile aux Coudres Wharf.....		861 92		861 92
Ile Perrot do	3,505 98			3,505 98
Ile Verte do	3,999 63			3,999 63
Laprairie Harbour (revetment wall).....	2,532 85			2,532 85
Les Eboulements Pier.....		1,000 68		1,000 68
Lévis Graving Dock	2,194 90		9,331 74	11,526 64
Longue Pointe and Boucherville Ferry Route.....	2,000 00			2,000 00
Longueuil Pier.....	5,892 50			5,892 50
Lourdes Pier, Lake Mégantic.....		169 68		169 68
Malbaie Pier.....		1,039 07		1,039 07
Matane do		3 57		3 57
New Carlisle Pier.....	8,242 60			8,242 60
Newport River.....	1,999 97			1,999 97
Percé Pier.....	4,111 45			4,111 45
Piers below Quebec.....			9,679 41	9,679 41
Piopolis Pier, Lake Mégantic.....		169 68		169 68
Pointe à Valois Wharf (extension).....	2,976 88			2,976 88
Pointe St. Pierre Harbour.....	1,985 00			1,985 00
Port Daniel Wharf (extension).....	4,460 23			4,460 23
Quebec Harbour.....			20 10	20 10
Rimouski Pier.....	5,507 10			5,507 10
Rivière Cap de Chatte.....	300 00			300 00
do David, repairs to bridge abutments.....		416 00		416 00
do des Prairies—Improvements at "Pointe à la Carrière".....	3,777 38			3,777 38
do du Lièvre—Locks, &c.....	50,280 50			50,280 50
do du Loup Pier		286 68		286 68
do L'Assomption	3,497 10			3,497 10
do Mackinac.....	513 19			513 19
do Nicolet—Harbour of Refuge	12,492 72			12,492 72
do Onelle Pier		484 80		484 80
do Saguenay—Petite Décharge, Lake St. John.....	200 00			200 00
do Ste. Anne de la Perade.....	2,000 00			2,000 00
do St. Francis.....	4,953 48			4,953 48
do St. Lawrence—Ship Channel	121,614 08			
do do do (Expenditure as- sumed by Dominion).....	2,725,504 10			2,847,118 18
do St. Maurice—West channel at mouth.....	4,000 00			4,000 00
do Yamaska—Stone protection to dam.....	4,950 25			4,950 25
do do Lock—Working expenses.....			541 73	541 73
Sorel Ice Piers.....	2,499 43			2,499 43
Ste. Adelaide de Palos (Little Palos).....	11,840 50			11,840 50
St. Anicet Pier.....		48 67		48 67
Ste. Anne du Saguenay Pier.....	2,045 50			2,045 50
St. Irène Pier.....		501 73		501 73
St. Laurent Pier (Ile d'Orléans).....	1,578 31			1,578 31
St. Michel de Bellechasse Pier.....		987 02		987 02
St. Siméon Pier.....	906 67			906 67
St. Thomas de Montmagny Pier.....		112 98		112 98
St. Timothée Piers.....	3,773 15			3,773 15
Three Rivers Pier.....	4,145 51			4,145 51
Trois Pistoles Pier—Extension.....	2,640 14			2,640 14
Victoria Bay Pier—Lake Mégantic.....		80 00		80 00
Carried forward.....	3,963,196 69	235,916 82	342,130 56	4,541,244 07

APPENDIX No. 1—Continued.

Name of Work.	Con- struction and Improve- ments.	Repairs.	Staff and Main- tenance.	Total.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Brought forward.....	3,963,196 69	235,916 82	342,130 56	4,541,244 07
HARBOURS AND RIVERS—Concluded.				
<i>Ontario.</i>				
Burlington Bay Channel.....		842 78	577 88	1,420 66
Cobourg Harbour.....	6,265 41			6,265 41
Collingwood Harbour.....	3,808 09			3,808 09
Goderich do.....	615 00			615 00
Harbours generally.....			10,285 42	10,285 42
Kaministiquia River.....	25,770 25			25,770 25
Kincardine Harbour.....	4,999 30			4,999 30
Kingston Graving Dock.....	92,578 68			92,578 68
do Harbour.....	5,924 81			5,924 81
Little Current, Lake Huron.....	8,913 57			8,913 57
Little Nation River.....	4,007 35			4,007 35
Meaford Harbour.....	4,987 84			4,987 84
McGregor's Creek.....	2,549 80			2,549 80
Midland Harbour.....	21,718 11			21,718 11
Owen Sound Harbour.....	14,584 39			14,584 39
Penetanguishene Harbour.....	5,316 22			5,316 22
Port Albert do.....	40 00			40 00
Port Arthur do.....	107,172 10			107,172 10
Port Elgin do.....	2,167 33			2,167 33
Port Hope do.....	2,534 20			2,534 20
Portsmouth do.....	2,054 28			2,054 28
Rat Portage Dam.....	228 70			228 70
Radeau River—Dredging North Branch.....	3,592 43			3,592 43
Rivière aux Puces.....	267 00			267 00
River Ottawa—Narrows above Pembroke.....	3,753 50			3,753 50
do Sydenham.....	147 24			147 24
do Thames—Entrance Channel.....	4,179 00			4,179 00
Rondeau Harbour—McNamee & Co.'s claim.....	1,286 58			1,286 58
Sault Ste. Marie Pier.....		1,269 31		1,269 31
Southampton Harbour.....	3,014 32			3,014 32
Summerstown Wharf.....	325 00			325 00
Toronto Harbour.....	39,641 01			39,641 01
Warton do.....	6,638 40			6,638 40
<i>Manitoba.</i>				
Harbours Generally.....			2,982 30	2,982 30
<i>British Columbia.</i>				
Columbia River—Improvements above Golden.....	\$4,992 83			
do —Improvements between Revelstoke and Arrow Lake.....	5,903 66			
Cocquiland River.....	10,896 49			10,896 49
Cowichan do.....	999 57			999 57
Esquimalt do.....	999 99			999 99
Esquimalt Graving Dock.....	7,150 00		12,719 94	19,869 94
Fraser River.....	19,638 21			19,638 21
Harbours, &c., generally.....			1,591 65	1,591 65
Nanaimo Harbour—Removal of Nickel Rock.....	14,971 84			14,971 84
Stena River.....	1,600 00			1,600 00
Stena do.....	302 09			302 09
Victoria Harbour.....	5,985 38			5,985 38
DREDGING PLANT.....	13,693 41	29,696 79		43,390 20
Carried forward.....	4,418,513 58	267,725 70	370,287 75	5,056,527 03

APPENDIX No. 1—Continued.

Name of Work.	Con- struction and Improve- ment.	Repairs.	Staff and Main- tenance.	Total.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Brought forward.....	4,418,513 58	267,725 70	370,287 75	5,056,527 03
DREDGING. /				
<i>Nova Scotia.</i>				
Arisaig.....	\$ 1,405 55			
Barrington.....	2,484 62			
Cow Bay.....	1,732 97			
Lockport.....	3,101 68			
Mabou.....	1,163 01			
Main à Dieu.....	2,491 66			
Pictou Market Wharf.....	3,264 47			
St. Peter's Canal.....	143 74			
Tracadie.....	1,171 29			
	\$ 16,958 99			
<i>Prince Edward Island.</i>				
Charlottetown Railway Wharf.....	\$ 1,178 44			
Red Point Wharf (dredging basin).....	758 29			
North Rustico.....	4,203 23			
South do.....	3,617 25			
	9,757 21			
<i>New Brunswick.</i>				
Dalhousie.....	\$ 2,804 13			
Grand Lake.....	4,151 30			
Kennebecasis.....	109 26			
Oronecto.....	2,112 81			
Richibucto.....	2,577 11			
Traverse.....	3,203 34			
	14,957 95			
Total Maritime Provinces.....	\$ 41,674 15			
<i>Quebec.</i>				
Beauharnois.....	\$ 769 41			
Charlemagne.....	924 65			
Chateauguay.....	726 63			
Como, River Ottawa.....	464 86			
Hudson, do.....	860 75			
Kiernan Bay.....	347 37			
Lachine.....	967 92			
Montebello.....	454 38			
Pointe aux Anglais, River Ot- tawa.....	910 05			
Riviere du Loup (en bas).....	970 89			
River Saguenay.....	100 80			
River St. Lawrence.....	5,010 75			
River do —St. Louis Rapids.....	327 31			
St. Placide.....	812 37			
Generally.....	779 04			
	14,427 18			
Carried forward.....	56,101 33	4,418,513 58	267,725 70	370,287 75 5,056,527 03

APPENDIX No. 1—Continued.

Name of Work.	Con- struction and Improve- ments.	Repairs.	Staff and Main- tenance.	Total.	
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	
Brought forward	\$ 56,101 33	4,418,513 58	267,725 70	370,287 75	5,056,527 03
DREDGING—Concluded.					
<i>Ontario.</i>					
Bowmanville	\$ 757 81				
Brighton	736 43				
Goderich	1,850 25				
Kincardine	1,442 45				
Kingsville	307 50				
Newcastle	371 30				
Port Hope	1,263 59				
Rideau River, North Branch	666 74				
River St. Claire (Pt. Edward)	5,000 00				
do Thames	190 00				
Southampton	158 06				
Thornbury	1,030 00				
Generally	3,680 70				
	17,454 83				
<i>Manitoba.</i>					
Red River	\$8,640 75				
White Mud River	5,335 29				
Generally	767 85				
	14,743 89				
<i>British Columbia.</i>					
Fraser River	\$4,423 30				
Victoria Harbour	9,989 28				
	14,412 58				
GENERAL SERVICE	6,495 19	109,207 82			109,207 82
SLIDES AND ROOMS.					
Saguenay District		1,999 83	1,140 12		3,139 95
St. Maurice do		104 50	4,753 76	13,957 09	18,815 35
Ottawa do				25,631 34	25,631 34
Ottawa River Slides	\$9,486 39	6,497 86			6,497 86
Gatineau do	1,562 04	499 65			499 65
Madawaska do	1,698 13				
Black do	1,072 77				
Coalinge do	65 00				
Dumoulin do	58 56				
Petewawa do	286 40				
Newcastle District Slides		14,229 29	1,543 92		14,229 29
		134 07	1,371 75		3,049 74
ROADS AND BRIDGES.					
<i>Ontario.</i>					
Des Jochims Bridge		19 80			19 80
Ottawa City Bridges and approaches thereto:—					
Cartier Square	\$ 1,508 56				
Chaudière Bridges	1,929 23				
Dufferin Bridge	142 00				
Carried forward	\$ 3,579 79	4,534,977 28	290,080 33	412,560 22	5,237,617 83

APPENDIX No. 1—Continued.

Name of Work.	Con- struction and Improve- ments.	Repairs.	Staff and Main- tenance.	Total.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Brought forward.....\$ 3,579 79	4,534,977 28	290,080 33	412,560 22	5,237,617 83
ROADS AND BRIDGES—Concluded.				
Ontario—Concluded.				
Ottawa City Bridges and approaches thereto—Con.				
Maria Street Bridge.....	30 00			
Nepean Point	237 28			
Ottawa Street, New Edinburgh.....	100 00			
Sappers' Bridge.....	40 60			
St. Patrick Street.....	344 25			
Union Suspension Bridge.....	698 75			
Wellington Street.....	6,820 98			
			11,851 65	11,851 65
Ottawa Iron Truss Bridge.....	32,035 15			32,035 15
Portage du Fort Bridge.....	72 00			72 00
Red River Route			36 00	36 00
North-West Territories.				
Battleford Bridge, Battle River	22,906 70			22,906 70
Belly River Bridge, Lethbridge.....	24,689 28			24,689 28
Bow River Bridge, near Calgary.....	1,817 40			1,817 40
Edmonton and Athabaska Landing Trail Bridges....	20 00			20 00
Regina, Wascana Dam—Filling in road, &c.....	399 90			399 90
TELEGRAPH LINES.				
Nova Scotia.				
Brier and Long Islands and Digby Cable.....	151 60			151 60
Canso to Dartmouth.....	2,500 00			2,500 00
Cape Sable	\$ 312 04			
Cheticamp	868 51			
Low Point.....	50 00			
Meat Cove	1,718 19			
	\$ 2,948 74			
Prince Edward Island.				
Prince Edward Island and Mainland (subsidy)			1,946 66	1,946 66
New Brunswick.				
Bay of Fundy.....	\$ 1,023 99			
Escuminac	432 89			
	\$ 1,456 88			
Quebec.				
Anticosti.....	\$ 1,879 08			
Grosse Ile Quarantine Station.....	1,039 16			
Magdalen Islands	2,249 59			
North Shore—Towards Pointe aux Esquimaux.....		10,311 38		10,311 38
do East Bersimis..	3,407 09			
do West do ..	5,000 89			
	\$ 13,575 81			
Carried forward.....\$ 17,981 43	4,629,880 69	290,080 33	426,394 53	5,346,355 55

APPENDIX No. 1—*Concluded.*

Name of Work.	Con- struction and Improve- ments.	Repairs.	Staff and Main- tenance.	Total.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Brought forward..... \$ 17,981 43	4,629,880 69	290,080 33	426,394 53	5,346,355 55
TELEGRAPH LINES—<i>Concluded.</i>				
<i>Newfoundland.</i>				
Cape Ray..... 250 00				
GENERALLY..... 8,012 15				
Total telegraph lines, lower St. Lawrence..... 826,243 58			26,243 58	26,243 58
<i>Ontario.</i>				
Pelée Island.....			89 56	89 56
<i>North-West Territories.</i>				
Panff line..... 85 64				85 64
Clark's Crossing and Saskatoon—repoling..... 690 00				690 00
Telegraph lines generally.....			23,036 57	23,036 57
<i>British Columbia.</i>				
Ashcroft and Barkerville.....			6,495 23	6,495 23
Agent and contingencies.....			5,299 87	5,299 87
Bonilla Point to Victoria..... 13,046 17				13,046 17
TELEGRAPH SERVICE GENERALLY.....			9,031 93	9,031 93
COLLECTION OF SLIDES AND BOOMS DUES.				
St. Maurice District..... 81,144 87				
Ottawa District..... 6,625 37				
MISCELLANEOUS.				
Surveys and Inspections.....			24,885 55	24,885 55
Surveys and plans of Government properties.....			2,826 20	2,826 20
Abitations and Awards.....			2,166 66	2,166 66
Monument to Col. Williams—Government Grant..... 1,000 00				1,000 00
Peloquin & Phaneuf—Compensation for loss of barge at Nicolet.....			400 00	400 00
Widow James Grant—Gratuity, 2 months salary of her late husband.....			75 00	75 00
Totals.....	4,644,792 50	290,080 33	534,714 92	5,469,597 75
WORKS AUTHORIZED BY SPECIAL ACTS OF PARLIAMENT.				
Quebec Harbour Improvements.....	248,400 00			248,400 00
Grand Totals.....	4,893,192 50	290,080 33	534,714 72	5,717,997 75

O. DIONNE,
*Accountant.*DEPARTMENT OF PUBLIC WORKS,
OTTAWA, 29th October, 1890.

APPENDIX No. 2.

R E P O R T

ON

P U B L I C B U I L D I N G S

THROUGHOUT THE DOMINION,

FOR THE FISCAL YEAR ENDED 30TH JUNE, 1890,

BY

THOMAS FULLER, CHIEF ARCHITECT.

APPENDIX No. 2.

REPORT OF THE CHIEF ARCHITECT.

Ref. No. 111234.

CHIEF ARCHITECT'S OFFICE,
OTTAWA, 31st August, 1890.

SIR,—I have the honour to transmit herewith the Annual Report on Public Buildings and Works under my charge, for the fiscal year ended 30th June, 1890.

I have the honour to be, Sir,

Your obedient servant,

THOMAS FULLER,
Chief Architect.

A. GOBEIL, Esq.,
Secretary Department of Public Works, Ottawa.

PROVINCE OF PRINCE EDWARD ISLAND.

CHARLOTTETOWN.

DOMINION BUILDING.

The town water supply was connected with the building, some additional plumbing and water service put in, the ventilation improved and additional furniture and fittings supplied and the grounds were laid out in grass plots, walks, &c. Supervising architect, Mr. W. E. Harris.

MONTAGUE.

POST OFFICE.

Some minor ordinary repairs to plaster, woodwork, &c., were effected.

PROVINCE OF NOVA SCOTIA.

AMHERST.

PUBLIC BUILDING.

The walls were cleaned and tinted, and minor repairs of plumbing, plastering and woodwork were effected.

ANNAPOLIS.

POST OFFICE, &C., BUILDING.

This building which was described in my report of last year has since been continuously carried on and is expected to be completed during the fiscal year 1890-91.

Plans, &c., prepared and work superintended by this Department.

Clerk of Works, Mr. Chas. Jacques.

Contractors, Messrs. Rhodes, Curry & Co., Amherst, N.S.

ANTIGONISH.

PUBLIC BUILDING.

Some alterations were made and fittings supplied in the Customs offices; the heating apparatus was extended and repaired, and some repairs were done to roof, cornice, &c.

Clerk of Works, Mr. John E. Turnbull.

HALIFAX.

DOMINION BUILDING.

The Postmaster's office was altered in position, fitted up and painted, large glass doors were put up; the Post Office Inspector's rooms were cleaned, tinted and furnished with oil cloth, &c., and a screen, &c., provided for Inland Revenue office.

The walls and ceilings of the offices of the Assistant Receiver General and Savings Bank were cleaned and tinted and the woodwork painted; screens and ventilators in windows, and carpets and book cases in offices were furnished, and the hardwood of counters and fittings were cleaned and varnished.

Clerk of Works, Mr. John E. Turnbull.

EXAMINING WAREHOUSE.

The offices on ground floor were ceiled in wood, some shelving was put in parcel office, and the sidewalks and the front of building were repaired.

A fire protection service with two inch hose and fittings on each floor was put in and some minor changes made in heating apparatus.

Clerk of Works, Mr. John E. Turnbull.

IMMIGRATION BUILDING.

A contract for the construction of this building at Deepwater Terminus, Halifax, N.S., was entered into 14th April, 1890, and the building is now practically completed. It is a one storey wooden building 262 feet in length, but of varying width, from 58 feet at its greatest to 7 feet at its least, and, excepting three small offices for baggage, tickets and agent, the floor space is undivided.

Adjoining is an old three storey and attic wooden warehouse, 50 feet by 30 feet, which has been fitted up and now furnishes the following accommodation:

On the ground floor a stairway, hall, kitchen, coal store, storeroom and pantry; on the second flat a diningroom and pantry; on the third flat eight rooms and in the attic four rooms.

Plans, &c., prepared and work superintended by Mr. J. C. Dumaresq, architect, Halifax.

Clerk of Works, Mr. D. Grant.

NAPPAN.

EXPERIMENTAL FARM BUILDINGS.

The buildings described in my report of last year are practically completed. Plans for a heating apparatus at Superintendent's residence are in course of preparation.

Plans prepared and work carried on under the supervision of this Department. Contractors, Messrs. Rhodes, Curry & Co.

NEW GLASGOW.

PUBLIC BUILDINGS.

Owing to the rapid corrosion of the boiler tubes, owing to the peculiar properties of the water, brass tubes were substituted for the wrought iron boiler tubes.

Clerk of Works, Mr. John E. Turnbull.

PICTOU.

CUSTOM HOUSE.

The drain crossing the lot consisting of two 12 inch pipes carrying the town sewage to the harbour became blocked and broken, and was abandoned; a new drain by a shorter route was put in, and a catch basin placed at the point of entrance of the city sewage.

Clerk of Works, Mr. John E. Turnbull.

SYDNEY.

POST OFFICE, &c., BUILDING.

This building which was described in my report of last year has since been carried on continuously, and it is expected will be completed before the close of the current year.

On 10th April, 1890, a contract for the construction of a heating apparatus was entered into.

Plans, &c., prepared and work supervised by this Department.

Clerk of Works, Mr. T. E. Burchell, Sydney.

Contractors for the building, Messrs. Connor & Donald, Moncton.

Contractors for the heating apparatus, The Cape Breton Foundry Company.

TRURO.

PUBLIC BUILDING.

Some repairs were made to plastering and to the brickwork of annex.

Clerk of Works, Mr. John E. Turnbull.

WINDSOR.

POST OFFICE BUILDING.

The drains were examined and some obstructions removed, and some slight repairs were made to furnace.

Clerk of Works, Mr. John E. Turnbull.

YARMOUTH.

PUBLIC BUILDING.

Some outside painting was done; some additional furniture supplied, and trifling ordinary repairs executed.

PROVINCE OF NEW BRUNSWICK.

BATHURST.

PUBLIC BUILDING.

A four dial illuminated striking clock was placed in the clock tower, and some repairs were made to plumbing.

Clerk of Works, Mr. John E. Turnbull.

Contractor for clock, Mr. E. Chanteloup, Montreal.

CARLETON.

POST OFFICE.

Minor repairs to furniture, stoves, locks, &c., were effected under the supervision of Mr. W. J. McCordock.

DALHOUSIE.

POST OFFICE.

This building which was described in my report of fiscal year 1888-89, is completed, and is being fitted up, furnished and supplied with a hot water heating apparatus.

Owing to the danger from sea wash a cribwork was erected to protect the site.

Plans, &c., prepared and work carried out under the supervision of this Department.

Clerk of Works, Mr. J. C. Barberie.

- Contractor for building, Mr. J. G. Mackenzie, Dalhousie.

Contractor for heating apparatus, Mr. T. Campbell, St. John.

FREDERICTON.

POST OFFICE, &c., BUILDING.

Additional grading of Post Office lot was done.

Plans, &c., for a hot water apparatus to heat the building, are in course of preparation.

Clerk of Works, Mr. F. S. Hilyard.

MONCTON.

POST OFFICE.

Some disintegrated bricks in gable and boundary wall were cut out and reset; the outside of walls pointed, a new chimney flue for caretaker provided, plastering repaired, ceilings whitened and walls tinted, a portion of the woodwork repaired and painted, some glazing done and a number of door labels furnished.

Clerk of Works, Mr. John E. Turnbull.

NEWCASTLE.

PUBLIC BUILDING.

Owing to a change in the docks it became necessary to carry the public drain farther out, which was done under the supervision of Mr. Henry White, Bathurst.

PARTRIDGE ISLAND (ST. JOHN).

QUARANTINE STATION.

Hospital No. 1 had shingling repaired; new steps and covering to outside stair to upper flat; two chimneys taken down and rebuilt; plastering repaired; windows glazed and painted, and new fastenings provided for doors.

Hospital No. 2 had windows reglazed and painted; chimneys repaired and new fastenings provided for doors.

Wash house roof was reshingled and shingling of walls railed where loose.

The chimney, fire places, hearths and furnaces of boiler were repaired.

Two gates to the hospital grounds were repaired and rehung.

Works carried out under the supervision of Mr. W. J. McCordock.

PORTLAND (ST. JOHN).

POST OFFICE.

Minor repairs to counter, stove, &c., were made under the supervision of Mr. W. J. McCordock.

ST. JOHN.

CUSTOM HOUSE.

The yard on Water street was laid with asphalt; the main sewer, north wing, where broken, was renewed and traps supplied with cast-iron man holes, having covers on sidewalk level. The furnaces under boilers were relined with fire brick and supplied with new dead plates.

Repairs were made to water closets, urinals, gas and steam fittings, electric bells, hydraulic hoist, and pointing was done around windows on southern end of building.

Furniture was supplied to the Inland Revenue, Customs and Public Works offices, and blinds were put up to windows in long room.

Works executed under the supervision of Mr. W. J. McCordock.

POST OFFICE.

• The main sewer pipes were repaired, and a 4½ inch cast-iron pipe carried from thence through roof. New speaking tubes, linoleum mats and some articles of furniture were supplied and the iron gates and shutters were painted.

Repairs were made to furnace, elevators and furniture.

Work carried out under the supervision of Mr. W. J. McCordock.

MARINE HOSPITAL.

Minor repairs were made to the heating apparatus, sewage pipes and roof of building under the supervision of Mr. W. J. McCordock.

PENITENTIARY.

The brick wall of shop, and chimney and slating of prison roof were repaired and all walls pointed; the broken glass in buildings was replaced and the sashes painted.

Work carried out under the supervision of Mr. W. J. McCordock.

SAVINGS BANK.

A new water closet was fitted up on the second floor in place of one worn out; gas pipes were repaired and new burners supplied, and a street ventilator placed on main sewer.

ST. STEPHEN.

PUBLIC BUILDING.

The outside brickwork was pointed, gas fittings and a chimney cowl supplied, and some minor repairs done to plumbing.

SUSSEX.**PUBLIC BUILDING.**

Exterior brickwork pointed, and in places repaired; front steps taken down and reset; roofs of buildings and outside wood-work painted; entrance floor and plastering repaired.

Clerk of Works, Mr. John E. Turnbull.

WOODSTOCK.**POST OFFICE, CUSTOM HOUSE, &c.**

An illuminated striking clock has been provided and set up in the turret, and a flag-staff on the roof of the building.

Clerk of Works, Mr. H. N. Black, Architect.

Contractor for clock, Mr. E. Chanteloup, Montreal.

PROVINCE OF QUEBEC.**AYLMER.****POST OFFICE.**

This building, which was previously described, has been completed and occupied. Plans, specifications, &c., prepared, and works carried out under the supervision of this Department.

Clerk of Works, Mr. Thomas Symmes, Aylmer.

Contractor for the building and fittings, Mr. D. B. McDonald, Aylmer.

Contractors for heating apparatus, Messrs. Butterworth & Co., Ottawa.

CARILLON.**INLAND REVENUE OFFICES.**

This building, which was erected by the Department of Railways and Canals, was provided with the necessary furniture and fittings. A stable and shed 42 feet by 15 feet, and a fuel shed 24 feet by 20 feet were constructed.

CHICOUTIMI.**MARINE HOSPITAL.**

A drain from the hospital to the river, involving considerable rock cutting and excavation, was constructed; the building was painted throughout, the reservoir was enlarged and some repairs done to woodwork.

COATICOOK.**PUBLIC BUILDING.**

This building, which was described in my report for fiscal year 1887-88, has been completed, fitted up and occupied.

Plans and specifications prepared and work superintended by this Department.

Clerk of Works, Mr. Wright Sleeper.

Contractor for building and fittings, Mr. F. F. Shurtleff, Coaticook.

Contractor for heating, Mr. W. Clendenning, Montreal.

FRASERVILLE (RIVIÈRE DU LOUP).

POST OFFICE, &C., BUILDING.

On the 27th November a contract was entered into for the construction of this building on the corner of Iberville and Champlain streets. The building is to be two stories, basement and attic, 62 feet by 35 feet, to contain on the ground floor the Post Office and Examining Warehouse, on the first floor the Customs and Inland Revenue Offices; on the attic floor the caretaker's apartments and in the basement the heating apparatus and fuel.

The outside walls are to be of stone, the partitions, floors and roofs of brick.

Plans, &c., prepared and work superintended by this Department.

Clerk of Works, Mr. Elzéar Marquis, Fraserville.

Contractor, Mr. Alfred Lortie, Quebec.

GROSSE ISLE.

QUARANTINE STATION.

Repairs were made at the Sick Division Quarters, to the roofs, clap-boarding, outside doors, plaster, &c., and the walls outside painted and inside coloured. Eaves, gutters and fall pipes were supplied to gallery of brick hospital, and the doors, locks and ventilators repaired. Fences were constructed around bleaching ground and sergeants quarters and a new wall at western division.

Works carried out under the supervision of this Department.

Contractor, Mr. Alfred Lortie, Quebec.

HULL.

POST OFFICE.

An additional amount of grading was done, the entrance gates were repaired; and additions to and alterations of plumbing executed.

JOLIETTE.

POST OFFICE, &C.

This building is now completed and occupied.

Plans, &c., prepared and work carried out under the supervision of this Department.

Clerk of Works, Mr. A. Durand, Joliette.

Contractor, Mr. Geo. Beauceage, St. Alban, P. Q.

LACHINE.

POST OFFICE, &C., BUILDING.

A contract for the construction of this building on lot No. 253, fronting on St. Joseph street, was entered into 30th September, 1889. The building consists of a main portion 40 feet by 30 feet and an annex 20 feet by 11 feet, and will consist of a ground floor for the Post Office, and first and attic stories for the caretaker's apartments.

The walls are to be of stone; the partitions, floors and roof of wood. The front gable will carry a wooden clock turret with four openings for dials.

Plans, &c., prepared and work superintended by this Department.

Clerk of Works, Mr. Jos. Metayer, Lachine.

Contractor, Mr. Jos. Fitzpatrick, Joliette.

MONTREAL.

CUSTOM HOUSE.

Extensive renewals of metal roof covering, ornamental vases and woodwork of eaves were carried out. A one-storey wooden building, 25 feet 6 inches by 13 feet 6 inches, on a stone foundation, was built at the lower entrance of the Lachine Canal for the transaction of Customs business.

Alterations of plumbing and boiler were made; some new gas fittings were supplied; a new and larger gas main was put in cellar; repairs were effected in connection with plumbing, coal waggon, &c., and new screws and marble slabs were provided for coils in two of the tower rooms.

Superintending Architect, Mr. James Nelson.

EXAMINING WAREHOUSE.

Repairs to roof and skylight were effected.

The breeches stack of boilers was renewed, as also the iron smoke stack of chimney, and the old drain from Express office to street. The engines were thoroughly repaired and renewed; the shafting altered and repaired; the elevators and elevator gangways and hatches repaired; galvanized iron roofing repaired; new gas pendants placed in wine room and auction room; new coils put in drugs and chemicals room; all valves were over-hauled and repaired, and some general repairs done to heating apparatus.

Superintending Architect, Mr. James Nelson.

INLAND REVENUE OFFICES.

The heating apparatus piping in basement was covered with asbestos covering, and minor repairs were made to plumbing.

POST OFFICE.

A safe was supplied for the Northern Receiving office; the Assistant Postmaster's office was enlarged; a wire guard was placed at the east entrance; a new bag rack was supplied; and a large amount of general jobbing effected.

The hot water furnaces were taken down, repaired, altered, re-erected and recessed in brick, and a new radiator was put up in the stamp office; water closets in general office and inspector's office, were cleaned and repaired, and a new sink and two new basins were put in.

A Well's engine was put in for use as a motor for letter elevator, and the pulley belt repaired. The passenger elevator was repaired, provided with new chains, stripper rope, counter balance pins, water main, stays and bracket. Two additional telephones were provided.

Superintending Architect, Mr. James Nelson.

QUEBEC.

CITADEL.

Portions of the metal roof covering of His Excellency's quarters and some blinds of the ball-room, all of which were damaged by a wind storm, were repaired under the supervision of Mr. J. F. Peachy, Architect.

CUSTOM HOUSE.

The woodwork of ground floor rooms and hall, and the attic passage, were cleaned and repainted; the principal windows of the building were furnished with blinds, and some repairs made to safe door, under the supervision of Mr. J. F. Peachy, Architect.

EXAMINING WAREHOUSE.

neys were repaired.

IMMIGRATION BUILDING.

The drainage and water service were augmented and improved; the metal roof covering where destroyed by storm renewed; the plastering repaired and additional benches for the use of the immigrants provided.

Superintending Architect, Mr. J. F. Peachy, Quebec.

MARINE HOSPITAL.

Urinals have been placed in each flat, and further repairs made to plaster of walls and ceilings.

Superintending Architect, Mr. J. F. Peachy.

POST OFFICE.

Changes and additions to partitions, fittings, &c., of ground floor were made; screens for windows supplied, an iron partition was put in vault, additions were made to plumbing, some cleaning was done, and the gas fittings and plaster repaired.

Superintending Architect, Mr. J. F. Peachy.

ST. HYACINTHE.

POST, &c., BUILDING.

Plans for this building, which is to be situated on the corner of Girouard and St. Joseph streets, are completed.

ST. JEROME.

PUBLIC BUILDING.

This building, which was previously described, has been completed, fitted up, furnished and occupied.

Plans and specifications prepared and work supervised by this Department.

Clerk of Works, Mr. J. Matte.

Contractor for building and fittings, Mr. Joseph Fitzpatrick, Joliette.

Contractor for heating apparatus, Mr. E. Chanteloup, Montreal.

ST. VINCENT DE PAUL.

PENITENTIARY.

The following works were carried out by convict labour, under the supervision of this Department:

Western Dormitory Wing.—This portion, which is built of cut ashlar inside and out, 146 feet by 46 feet and 35 feet high above base, containing 120 cells, is now completed.

Boundary Wall.—This wall, to be 22 feet, 6 inches in height, will eventually enclose a plot of ground 686 feet by 615 feet, and is commenced on the north side of the enclosure, where 200 cubic yards are done. It will be of heavy cut ashlar, of which 20,000 cubic feet and 350 feet lineal of coping are cut.

Keepers' Hall.—Owing to the large glass surface in roof cooling the air and great difficulty in heating air inside, a glazed ceiling was put in.

Main Building Generally.—The brick arches of ceilings east and west dormitories, were pointed and painted; extensive repairs were made to the Protestant Chapel; a two-inch plank partition 90 feet by 12 feet, part of which is glazed, and sliding put up between the dining hall and kitchen; a self-acting bath and water closet was fitted up in the hospital, and the floor of the engine house has been replaced by six-inch flagging.

Steam Duct.—A cut stone duct was built 200 feet long by 4 feet by 3 feet, leading from the boiler house to the carpenters' shop.

Guards dwellings.—Stables and sheds were built; 200 yards of 9-inch drain laid from the buildings to the creek, and general repairs made.

Warden's residence.—An ice house, 36 feet by 24 feet, was built; a glazed double ceiling was put in conservatory, and 167 yards of 6-inch drain pipe laid to river.

Deputy Warden's residence.—A wooden fuel shed, 20 feet by 14 feet, was built.

Piggery.—20 new styes were built, bringing the accommodation up to 250 pigs, and the exterior of the building was painted.

Water supply.—A cribwork pier, 60 feet by 25 feet by 15 feet, was built to protect the waterworks pipe from the ice shove.

Plans prepared and work supervised by Mr. John Bowes, Architect.

THREE RIVERS.

CUSTOM HOUSE.

Repairs were made to the retaining wall of the Platon property, and to the roof, inside plumbing, painting and glazing of the Custom house.

Superintending Architect, Mr. O. Z. Hamel, Three Rivers.

POST OFFICE.

Some minor repairs to painting, glazing and woodwork were effected, and furniture was supplied to the Post Office Inspector's office.

Superintending Architect, Mr. O. Z. Hamel, Three Rivers.

PROVINCE OF ONTARIO.

ALMONTE.

POST OFFICE, &C., BUILDING.

The construction of this building, which was described in my last report, has been carried on since the date of contract, and, it is expected, will be completed during the fiscal year 1890-91.

Plans, &c., prepared and work supervised by the Department.

Clerk of Works, Mr. Andrew Bell, Almonte.

Contractor, Mr. Robert Cameron, Almonte.

BERLIN.

POST OFFICE.

The heating mains in basement were covered with felting, &c., some minor changes were made in the heating apparatus and a connection made with the town water supply.

BRAMPTON.

POST OFFICE, &C., BUILDING.

This building which was described in my report of last year, is completed, fitted up, furnished and occupied.

Plans, &c., prepared and work supervised by this Department.

Clerk of Works, Mr. J. A. Trimble.

Contractors, Messrs. Perry, Masson & MacCullough, Brampton.

CAYUGA.

POST OFFICE.

Building completed and occupied.

Plans, &c., prepared and work supervised by this Department.

Contractors for building and fitting, Messrs. Draper Bros., Caledonia.

Contractor for heating apparatus, Mr. Adam Clark, Hamilton.

COBOURG.

POST OFFICE, CUSTOM HOUSE, &C.

The additions referred to in my report of last year have been completed, and the building furnished with a new hot water heating apparatus.

Plans, &c., prepared and work supervised by this Department.

Clerk of Works, Mr. Wm. Battell.

Contractors for additions, Messrs. R. & J. Henderson, Cobourg.

Contractors for heating apparatus, Messrs. Garth & Co., Montreal, P. Q.

DUNDAS.

POST OFFICE, &C.

New door spring, additional furniture and stoves were supplied.

GANANOQUE.

CUSTOM HOUSE.

A granolithic sidewalk was laid down on the street line, and some repairs done to heating furnace.

Contractor for sidewalk, Mr. Robt. Forsyth.

POST OFFICE.

A granolithic sidewalk was laid down along the street line.

Contractor, Mr. Robt. Forsyth, Montreal.

GODERICH.

POST OFFICE, &C., BUILDING.

This building, which was described in my last report, is expected to be completed at an early date. Plans, &c., have been prepared and a contract entered into for the construction of a hot water heating apparatus.

Plans, &c., prepared, and work supervised by this Department.

Supervising Architect (since decease of Mr. G. F. Durand), Mr. Joseph Henry, London.

Clerk of Works, Mr. Edward Sharman, Goderich.

Contractors for building, Messrs. Tambling & Jones, London.

Contractors for heating apparatus, Messrs. Garth & Co., Montreal.

GUELPH.

POST OFFICE.

The attics were fitted up for use of the caretaker, the basement water closets removed, and a new set of ventilated water closets constructed in attic under the supervision of this Department.

Architect, Mr. D. B. Dick, Toronto.

HAMILTON.

POST OFFICE, &C., BUILDING.

An illuminated 4 dial striking clock was fitted up in tower; the eaves of the rear of main building and Examining Warehouse were provided with troughs and the roofs and vallies repaired; the boiler house floor was repaired; two new coils were provided in attic; plate glass panels were put in Gas office door; the fanlights on the Custom House floor, and minor repairs done to doors, locks, &c.

LINDSAY.

POST OFFICE, CUSTOMS AND INLAND REVENUE OFFICES.

This building is now completed and occupied.

Plans and specifications prepared and works supervised by this Department.

Clerk of Works, Mr. H. Walters, Lindsay.

Contractor for construction of building and for fittings, &c., Mr. P. Navin, Lindsay.

Contractor for heating apparatus, Mr. E. Woods, Lindsay.

NAPANEE.

POST OFFICE, CUSTOM HOUSE AND INLAND REVENUE.

This building has been completed, fitted up, furnished and occupied.

A hot water heating system has been supplied; and a four dial illuminated striking clock placed in the tower.

Plans, &c., prepared and works supervised by this Department.

Supervising Architect, Mr. F. Bartlett, Napanee.

Clerk of Works, Mr. J. E. Herring, Napanee.

Contractor for building, fittings and heating, Mr. Geo. Newlands, Kingston.

Contractor for clock, Mr. F. W. Smith, Napanee.

ORANGEVILLE.

POST OFFICE BUILDING.

A new gasoline tank was supplied and connected with carbonetter; a new main supplying 3 new lights was put in, and some repairs done to the existing piping.

OTTAWA.

CENTRAL EXPERIMENTAL FARM (NEAR OTTAWA).

The greenhouses and seed store, cottage No. 1, and the stable described in my report of last year were completed during the fiscal year 1889-90.

A silo 40 feet by 20 feet and 24 feet in height, was constructed as a lean-to at western end of barn.

Two cottages similar to No. 1 cottage, described in my report of last year, were erected, one each at two of the entrance gateways.

A 1½ storey wooden building, 85 feet by 55 feet, for use as an implement and harness shed, was constructed at the southern side of the barnyard.

Plans, &c., prepared and work superintended by this Department.

Contractor for implement shed, cottages and silo, Mr. Wm. Stuart.

EASTERN BLOCK, DEPARTMENTAL BUILDING.

A steel and iron burglar-proof vault, for the use of the Finance Department, was erected in the north-western corner of the eastern end of the building adjoining the original vault. It measures 22 feet 6 inches by 17 feet 9 inches, by 13 feet 3 inches in height, and has an iron gallery 3 feet in width, 7 feet from the floor; on the four sides of the room, approached by two circular iron staircases. The outside walls, ceiling, vestibule and floor are 3½ inches in thickness of metal plates, 1½ inches of which is 5 ply welded chrome steel and iron plates, tempered and chilled drill proof. There are inside and outside burglar-proof doors, with both time and combination locks.

The skylights throughout have been repaired, reglazed and painted. Repairs were made to the roof, cement floors and plastering, the window shutters were repaired and painted; alterations were made to fittings, the outside walls were

pointed, and the offices of the Justice Department on the ground floor cleaned, tinted and painted.

Works carried on under the supervision of this Department.

GOVERNMENT HOUSE.

The brick outer walls of the conservatory and the stove houses being disintegrated by damp and frost, were taken down and replaced by walls of sawn cedar sheathed outside and in with V jointed pine boards; the plant tables in these buildings and the forcing pit being rotten, were renewed, and conservatory camelia and stove houses, and vinery were repainted externally.

1,275 lineal feet of boundary fence were built on back road, and 6,700 lineal feet of boundary fence painted two coats.

A new W. C. was fitted up in the coachman's apartments, about 200 lineal feet of gas pipe trench were opened to find and stop leakage, the chimneys were swept, and the furnaces, stoves and pipes cleaned and repaired.

The studio walls were wainscotted, stained and varnished; 1,600 yards distemping were done in kitchen wing and basement of main house; oil cloth on pantry floor and baize on main stairs, front hall stairs and private stair were renewed; worn-out holland blinds on 12 windows were renewed; and a quantity of linen, crockery, glassware and kitchen utensils was supplied to replace articles worn out or broken.

2,150 inches of coppers were re-tinned. Repairs were made to sidewalks throughout; brickwork of laundry building, where destroyed by frost, re-set; broken glass replaced; about 400 cane-seated chairs and other furniture were supplied, and general repairs in connection with the annual house-cleaning effected.

4,150 yards of carpet and matting were taken up, beaten, repaired and re-laid, and all the necessary preparations and work in connection with the various entertainments carried out.

A contract for the maintenance of the garden, lawns, propagating houses, and grounds generally, was entered into for one year and they were kept in an efficient manner by the contractors.

Works, &c., carried out under superintendence of this Department.

Clerk of Works, Mr. Wm. Hutchison.

Contractors for conservatory and grounds, Messrs. Sorley and Sims.

MAJOR'S HILL PARK.

A contract was entered into for one year for the maintenance of these grounds, and they have been kept in good order and some improvements made.

Contractor, Mr. L. Garelio.

NEW DEPARTMENTAL BUILDINGS, WELLINGTON STREET.

During the fiscal year, the Departments of Agriculture and Post Office were moved into this building, the Department of Indian Affairs having been previously installed, and supplementary fittings and furniture provided.

Plans, &c., prepared and work superintended by this Department.

Clerk of Works, Mr. Samuel Adams.

PARLIAMENT BUILDING.

The slate covering was removed from the front roof extending from the Eastern to the Western wing and was replaced by copper; the large sky-lights on Commons Chamber, were replaced by others of copper.

Extensive repairs were made to shelving and other woodwork in Library; sky-lights were repaired, repainted, and, in part, reglazed, and general repairs were made to cement floors, plastering, painting, slating and galvanized iron work under the supervision of this Department.

PARLIAMENT GROUNDS.

A contract for the maintenance of the grounds for the period of one year, was entered into and has been satisfactorily carried out under the supervision of this branch of the Department.

Contractor, Mr. N. Robertson.

PUBLIC BUILDINGS, REPAIRING STREETS, &c.

Scraping, cleaning and repairs were done to roadways of East and West Canal Streets, Nepean Point and Wellington street. The sidewalks and crossings of Wellington street, Cartier Square and St. Patrick street were repaired; the grass of boulevards at Geological Museum and Cartier Square was kept clipped; the ashes were removed from the Langevin Block, Museums and Printing Bureau, and the yards of these buildings kept clean.

The various roadways, sidewalks, footpaths, roofs and yards were kept clear of snow during the winter.

PRINTING BUREAU.

This building is completed, fitted up and occupied.

Plans and specifications prepared and work superintended by this Department.

Superintending Architect, Mr. J. P. M. Lecourt.

Clerk of works, Mr. H. L. Pinard.

Contractor, Mr. John E. Askwith, Ottawa.

WESTERN BLOCK, DEPARTMENTAL BUILDING.

The Post Office Department was removed to the Langevin Block and the offices thus rendered vacant were assigned to the Department of Inland Revenue, excepting a small number which fell to the Department of Militia and Defence.

These offices and those of the Departments of Railways and Canals, Marine, Customs and Public Works were cleaned, tinted and painted, and a chemical laboratory with all necessary fittings and fixtures fitted up for the Department of Inland Revenue.

The skylights throughout were repaired, re-glazed and painted; the shutters were repaired and re-painted, and some pointing done to outside walls.

Works carried out under the supervision of this Department.

VICTORIA HALL.

A close board fence, painted, was constructed along the O'Connor street and Queen Street fronts of the vacant property, and outside wooden porches furnished for the basement of the building.

PEMBROKE.

POST OFFICE.

Completed and occupied.

Plans, &c., prepared and work superintended by this Department.

Clerk of Works, Mr. J. L. Morris, P.L.S., Pembroke.

Contractors for construction of building, Messrs. Munro, Beatty & Grieve, Pembroke.

Contractors for heating apparatus, Messrs. Dunlop & Chapman, Pembroke.

STRATFORD.

PUBLIC BUILDING.

A two storey and basement addition, measuring 46 feet by 14 feet, was constructed at the eastern side for the use of the Post Office Inspector. There is a basement containing a furnace room, a fuel room and a W. C.; a ground floor con-

taining a secretary's office and an inspector's office, and a first floor containing a stationery office and a clerks office.

The two lower stories are of stone and the upper of brick. Fittings and furniture and a separate hot water apparatus were provided.

Plans, &c., prepared and work superintended by this Department.

Superintending Architect, Mr. J. R. Kilburn, Stratford.

Contractors, Messrs. Scrimgeour Bros., Stratford.

TORONTO.

CUSTOM HOUSE.

Usual and ordinary minor repairs were done to the building.

Repairs were made to plumbing, heating and gas services; a new gas pipe was run to the gauger's room and internal walls of basement whitewashed.

Superintending Architect, Mr. D. B. Dick, Toronto.

EXAMINING WAREHOUSE.

A new coal shed was built and some general repairs executed.

Exhaust pipe of engine was extended above roof of main building, a new coil supplied in hardware department, a number of leaking pipes were removed and replaced by new, the plumbing received minor repairs, all the valves were repaired and the boilers were repaired. Specifications, &c., prepared and work supervised by Mr. D. B. Dick, Architect.

IMMIGRATION BUILDING.

The drainage being by means of an open ditch, on the recommendation of the Sanitary Inspector a new sewer through grounds was put in, and under the supervision of Mr. D. B. Dick, Architect, Toronto.

INLAND REVENUE OFFICES.

A large quantity of old worn and faulty pipe in heating apparatus was replaced; the valves throughout were repacked, the plumbing subjected to minor repairs and the basement inside walls whitewashed, under the supervision of this Department.

POST OFFICE.

The plumbing of the water closets in yard was taken out and replaced by modern sanitary plumbing, general repairs were done to the building and fittings, and a fire escape furnished.

Split and worn heating pipes were removed from two radiators and from some of the basement mains and branches; all valves was repacked and the boilers were whitewashed.

Supervising architect, Mr. D. B. Dick, Toronto.

PORT COLBORNE.

POST OFFICE.

A building for the storage of coal and wood was erected.

PRESCOTT.

POST OFFICE, CUSTOM HOUSE AND INLAND REVENUE OFFICES.

These buildings are completed, supplied each with a hot water heating system and are expected to be fitted up ready for occupation at an early date.

Plans, &c., prepared and works superintended by this Department.

Clerk of Works, Mr. David Barr, Prescott.

Contractors for the building, Messrs. Cairns, Ward & Steele, Prescott.

Contractor for heating apparatus, Mr. Edward Smart, Brockville.

PETERBOROUGH.

POST OFFICE.

A striking clock, having four illuminated dials, has been fitted up in the tower by Mr. E. Chanteloup of Montreal, under the supervision of this Department.
Architect in charge, Mr. Jno. E. Belcher, Peterborough.

PORT ARTHUR.

POST OFFICE.

Negotiations with a view to obtain a site are in progress.

POST OFFICE INSPECTOR'S OFFICE.

Stoves, stovepipes and furniture were supplied and ordinary repairs done to office.

ST. THOMAS.

POST OFFICE, &C., BUILDING.

An iron fence on a stone wall was erected on the front street; extensions of the heating apparatus were effected.

Repairs were made to roof and eaves gutters, a new chimney flue was built; some sanitary re-arrangement of the plumbing made, the drain repaired; a new enlarged general delivery circle and a stamp vendor's counter were constructed, and some fittings supplied to the Customs, under the supervision of this Department.

Superintending Architect, Mr. Chas. Horton, St. Thomas.

TRENTON.

POST OFFICE, &C.

Building completed and occupied.

Plans, &c., prepared and work superintended by this Department.

Clerk of Works, Mr. Geo. Crowe.

Contractor, Mr. Walter Alford, Belleville.

PROVINCE OF MANITOBA.

BRANDON.

EXPERIMENTAL FARM BUILDING.

On 21st September, 1889, a contract was entered into for the construction of the barn and stabling, and on the 21st October, 1889, for the construction of the Superintendent's residence, both of which are now in progress.

The barn and stabling is similar to that at Indian Head, which was described in my report for last year.

The Superintendent's residence is to be a two-storey and attic wooden building on a stone foundation, having, on the ground floor, a hall, a sitting-room, a dining-room, an office, a kitchen and a shed; on the first floor four bedrooms, and in the attic three bedrooms.

Plans, &c., prepared and work supervised by this Department.

Superintending Architect, Mr. W. B. Marshall, Brandon.

POST OFFICE.

This building, which was described in my report of last year, has been carried on steadily, but is not expected to be completed until spring of 1891.

Plans for a heating apparatus are being prepared.

Plans and specifications prepared by this Department.
 Superintending architect, Mr. W. B. Marshall, Brandon.
 Clerk of Works, Mr. F. J. Chubb.
 Contractor, Mr. James Hanbury, Brandon.

ST. PAUL'S.

INDUSTRIAL SCHOOL.

The buildings for this institution were described in my last report and are now completed, and school building fitted up with a warming and ventilating apparatus. A drain from the school building to the Red River was put in.

Plans, &c., prepared by this Department.

Supervision by D. Smith, Clerk of Works, Winnipeg.

Contractors for construction of building, Messrs. Madden & Bruce, Winnipeg.

Contractors for drain, Messrs. Ronrke & Cass, Winnipeg.

Contractors for the heating and ventilating, Messrs. Smead & Dowd, Toronto, Ont.

STONY MOUNTAIN.

MANITOBA PENITENTIARY.

Prison Building.—A brick passageway between the prison and laundry was erected; the boilers were repaired and some painting and kalsomining was done.

Surgeon's and Chaplains' Residences.—These buildings which were previously described are completed, fitted up with hot water heating apparatus, bells and wardrobes, and provided with stables and fencing.

Guards' Cottages.—A summer kitchen to each of six kitchens was erected.

Smoke-house.—A smoke house, 12 feet by 12 feet, was erected.

General.—A double floor was built in blacksmith's shop and some general repairs made.

Plans, &c., prepared and work supervised by this Department.

Clerk of Works, Mr. D. Smith, Winnipeg.

Contractors for construction of Surgeon's and Chaplains' residences, Messrs. Tobin & O'Keefe, Ottawa.

Contractors for heating apparatus, Messrs. Garth & Co., Montreal.

WINNIPEG.

CUSTOM HOUSE.

Minor repairs were made to drainage, storm sashes and blinds.

Resident Clerk of Works, Mr. D. Smith.

EXAMINING WAREHOUSE.

A heating apparatus was provided, and some minor repairs effected to gas-fittings, storm sashes, &c.

Resident Clerk of Works, Mr. D. Smith.

POST OFFICE.

A stone sidewalk, 18 feet in width on Main street and 10 feet on Owen street, was constructed around this building. The water supply being deficient, storage and compression tanks were put in by J. E. Gelley, contractor.

Additions were made to the heating surafce, a storeroom was put in basement, a ladies' dressing room in Post Office, a glass partition and bells and speaking tube were provided, the letter hoist was improved and various ordinary repairs effected.

Works carried on under the supervision of this Department.

Clerk of Works, Mr. D. Smith.

NORTH-WEST TERRITORIES.

CALGARY.

BARRACKS.

The Barracks building, referred to in previous reports, was completed, and a new guard room, 58 feet by 24 feet, containing 12 cells, erected.

Plans, &c., prepared and works carried out under the supervision of this Department.

Clerk of Works, Mr. H. D. Johnson, Calgary.

Contractors, Messrs. Kennedy & Heney, Ottawa.

COURT HOUSE.

This building, which was described in my report of last year, is now completed, and is being furnished with a hot water heating apparatus.

Plans, &c., prepared and work supervised by this Department.

Clerk of Works, Mr. H. D. Johnson, Calgary.

Contractor for the building, Mr. J. G. McCallum, Calgary.

Contractor for heating apparatus, Mr. W. D. McDonald, Winnipeg, Man.

INDIAN HEAD.

EXPERIMENTAL FARM BUILDINGS.

The buildings referred to and described in my report of last year are completed and occupied.

Plans, &c., prepared and work carried out under the supervision of this Department.

Clerk of Works, Mr. Angus McKay.

Contractor, Mr. Isaac R. Reilly, Regina.

LETHBRIDGE.

BARRACKS.

A one and a half storey hospital building, 44 feet by 30 feet, was erected, and a kitchen wing to same is in course of construction.

An addition to recreation room, 36 by 12 feet, with cellar, was erected for canteen purposes.

Two of the barrack rooms were lined and ceiled with building paper, and 1 in. dressed lumber, oiled and varnished. Plastering was repaired generally, and kitchen kalsomined.

Plans, &c., prepared and work carried out under the supervision of this Department.

Clerk of Works, Mr. H. J. Peters, Regina.

MACLEOD.

BARRACKS.

The well was deepened and improved; and a tank of 10 feet stave by 8 feet 6 inches diameter and 6 feet in the ground placed near to it.

Plans, &c., prepared and work superintended by this Department.

Clerk of Works, Mr. H. J. Peters, Regina.

MOOSOMIN.

COURT HOUSE.

On the 18th day of April last a contract was entered into for the construction of this building on Lots 3, 4, 5 and 6, Block 25, and the works are now in progress.

The building will consist of a wooden two-storey main building, 65 feet by 33 feet, on a stone foundation, and a one-storey kitchen, 22 feet by 13 feet, resting on blocks. On the ground floor will be a guard room, a constable's room, two non-commissioned officers' offices, a sheriff's office, a clerk's office, two stairway halls, five cells and two brick vaults, one each for sheriff and clerk; on the first floor will be the court room, and a room each for judge, jury, counsel and witnesses. The basement will contain heating apparatus, fuel, &c.

Plans, &c., prepared and work carried out under the supervision of this Department.

Clerk of Works, Mr. Chas. Taylor, Moosomin.

Contractors, Messrs. Williams & Willoughby, Regina.

POLICE BARRACKS GENERALLY.

Various and numerous repairs and renewals, not elsewhere enumerated in this report, were carried out by police labour at the police posts at Calgary, Fort Macleod, Lethbridge, Maple Creek and Regina, under the superintendence of this Department.

QU'APPELLE.

IMMIGRANT SHED.

A portion of this building was fitted up for a court room, an office for the Clerk of the court, a barristers' room and a jury room, and accommodation arranged for the North-West Mounted Police, who have charge of the building. The well was cleaned, the pump-house repaired and furnished with a new pump, and the verandah roof renewed.

Works carried out under the supervision of this Department.

Clerk of Works, Mr. H. J. Peters.

REGINA.

BARRACKS.

Two stables, each 75 feet by 30 feet, with an addition 75 feet by 30 feet for saddle room, and one stable 50 feet by 28 feet, were erected.

A frame 50 feet high by 28 feet at base, supported on concrete and stonework foundation, to carry the 50,000 gallons of water supply, and fire protection tank, was put up.

Five water tanks were put in good order; wood box drains were laid from riding hall to water tank and to main drain to carry off water from roof, and a quantity of stone supplied for proposed new foundations.

Plans, &c., prepared and work carried out under the supervision of this Department.

Clerk of Works, Mr. H. J. Peters, Regina.

IMMIGRANT SHED.

This building, 50 feet by 24 feet, with kitchen and latrines, was erected and occupied. Owing to the cold weather during the early summer it was found necessary to build a chimney on the main building.

Plans, &c., prepared and work superintended by this Department.

Clerk of Works, Mr. H. J. Peters.

INDUSTRIAL SCHOOL.

This building which was described in my report of last year is now completed and supplied with a Smead-Dowd system of heating, closets and ventilation.

Plans, &c., prepared and work carried out under the superintendence of this Department.

Clerk of Works, Mr. H. J. Peters.

Contractors for erection of building. Messrs. Williams & Willoughby, Regina.

Contractors for heating, &c., The Smead-Dowd Co., Toronto.

NEW RESIDENCE FOR THE LIEUTENANT GOVERNOR.

This building, described in my last report, has been in progress since date of contract, and is expected to be completed during this summer.

Plans, &c., for hot water heating apparatus are prepared.

Plans, &c., prepared and work carried out under the supervision of this Department.

Clerk of Works, Mr. H. J. Peters.

Contractor, Mr. Wm. Henderson, Regina.

GAOL AND LUNATIC ASYLUM.

A cess pit, 15 feet by 10 feet by 8 feet, was formed 150 feet west of the building and the drain connected with it.

A water system, to supply from the Wascana Dam, and a steam heating and cooking service, are nearly completed; a boiler house, and two pairs of cottages, the latter for gaol officials, are in course of construction. The well has been cleaned and repaired, and a new pump put in.

Works carried out under the supervision of this Department.

Clerk of Works, Mr. H. J. Peters.

OLD GOVERNMENT HOUSE.

A wind mill and tank, a forcing house 52 feet by 20 feet, and a bay window to private drawing room, and a well house, were built; the conservatory was altered; two grates were put in, a well was sunk, a large quantity of papering was done, the roof and outbuildings were repaired and furniture and carpets supplied.

Work done under the supervision of this Department.

Clerk of Works, Mr. H. J. Peters, Regina.

POST OFFICE.

A well was sunk, a pump put in, and a well-house, a one-storey outbuilding, and latrines 20 feet by 16 feet, were built; 363 feet lineal of close board fence in rear and sides of property, and 140 feet lineal of wire fencing on front and south side, were built; a circular cistern 8 feet stave and 6 feet diameter, was built, sunk in ground and connected with eaves-troughs and fall pipes of house; awnings for two windows were provided, the entrance doors painted, the building banked with earth, and some general repairs executed.

Work done under the supervision of this Department.

Clerk of Works, Mr. H. J. Peters, Regina.

RIDING HALL.

This building, which was described in my report of last year, was completed.

Plans, &c., prepared and work supervised by this Department.

Clerk of Works, Mr. H. J. Peters, Regina.

Contractor, Mr. J. Stewart, Ottawa.

WHITEWOOD.

IMMIGRANT SHED.

An immigrant shed, 50 feet by 24 feet, on plan, with an addition for kitchen and latrines, was erected, under the supervision of this Department.

Clerk of Works, Mr. H. J. Peters, Regina.

PROVINCE OF BRITISH COLUMBIA.

ALBERT HEAD.

QUARANTINE STATION.

The landing stairs, eaten by teredo, were replaced; the wooden gutters of the buildings were repaired, the tank floor renewed and the hydraulic ram overhauled.

Works carried out under the supervision of Mr. F. C. Gamble, C. E.

KAMLOOPS.

INDIAN INDUSTRIAL SCHOOL.

The buildings in connection with this institution were described in my report of last year, and are now completed and occupied.

Plans, &c., prepared by this Department, and work carried out under the supervision of Mr. F. C. Gamble, C. E.

Clerk of Works, J. T. Burnyeat.

Contractor, Mr. John D. Ross, Kamloops.

KUPER.

INDIAN INDUSTRIAL SCHOOL.

The buildings of this institution were referred to in my report of last year, and are now completed.

Plans, &c., prepared by this Department, and work carried out under the supervision of F. C. Gamble, C. E.

Clerk of Works, Mr. Walter Ford.

Contractor, Mr. Wm. Rockett.

NANAIMO.

POST OFFICE, &C.

Inside water closets were provided for the Post Office and Savings Bank, and the outside earth closets converted into water closets and urinal; the whole of the interior was kalsomined or whitewashed, and some minor repairs were effected.

Work done under the supervision of Mr. F. C. Gamble, C. E.

NEW WESTMINSTER.

PENITENTIARY.

The Warden's residence, which was described in my report of last year, is completed and occupied.

Work carried out under the supervision of Mr. F. C. Gamble, C. E.

Contractors, Messrs. Ackerman Bros., New Westminster.

PUBLIC BUILDING.

Window guards for front doors and windows were provided, and minor repairs effected to windows, locks, &c., under the supervision of Mr. F. C. Gamble, C. E.

OLD CUSTOM HOUSE.

A new fence and sidewalk, in accordance with the requirements of the city of New Westminster, was erected on Columbia street, in front of the old Custom House lot, under the supervision of Mr. F. C. Gamble, C.E.

VANCOUVER.

POST OFFICE, &C., BUILDING.

Plans and specifications for the construction of this building are now prepared, and it is expected that the contract will be awarded at an early date.

VICTORIA.

"C" BATTERY BARRACKS.

On 3rd February, 1890, a contract was entered into for the construction of the officers' quarters, a two and one-half storey wooden building on a stone foundation, 210 feet long by 36 feet, exclusive of kitchen wings. It will consist of a Commandant's house, a Major's house, a Surgeon's house, a 1st and 2nd Lieutenant's house, a mess house, two houses for attached officers and one for a Quartermaster.

Plans, &c., prepared, and work supervised by this Department.

Supervisor, Mr. F. C. Gamble, C.E., Victoria.

Contractors, Messrs. Woodworth & Munday.

CUSTOM HOUSE.

Some new furniture and electric bells were put in, the vault of Inland Revenue Department was provided with new cement floor and shelving, and repairs effected to plumbing and metal roof covering.

POST OFFICE.

Repairs were made to gas fittings, furniture, roof, &c.; chairs and carpets were furnished the postmaster, and some minor ordinary repairs effected.

Works executed under the supervision of Mr. F. C. Gamble, C.E.

GENERALLY.

Usual and ordinary repairs were executed, sundry articles of furniture and fittings provided, cleaning, colouring, painting and minor alterations and improvements effected to a large number of buildings not herein referred to.

LIGHTING DOMINION BUILDINGS.

The lighting of the various Dominion buildings, excepting at Ottawa, and the penitentiaries and military buildings, is under the control of this branch of the Department. Of these buildings 62 were lighted by gas, 14 by incandescent electric light, 1 by gasoline and the remainder by coal oil, while at several of the last mentioned the entrance is illuminated by an arc light outside.

WATER FOR DOMINION BUILDINGS.

The water supply for the various public buildings, excepting at Ottawa, and the penitentiaries and military buildings, is controlled by this branch of this Department. Fifty-nine buildings at thirty-eight localities have water services connected with the water supply of the local water works companies, the remainder being in general supplied with wells, pumps and tanks.

HEATING DOMINION BUILDINGS (FUEL).

Tenders were invited by public advertisement for the supply of coal at ninety-one of the public buildings, and coal and wood supplied to about one hundred buildings in all.

ENGINEERS, ENGINEMEN, FIREMEN, &c., PUBLIC BUILDINGS.

The various engineers, enginemen, firemen and caretakers, and the heating apparatus of Dominion Public Buildings, with the exception of those at the various penitentiaries and the military buildings, are under the control of this branch of the Department.

APPENDIX No. 3.

L I S T

OF

ENGINEERS, ENGINEMEN, FIREMEN AND CARETAKERS

OF

PUBLIC BUILDINGS THROUGHOUT THE DOMINION,

GIVING

DATE OF APPOINTMENT, SALARY PAID, &C.

APPENDIX No. 3.

Ref. No. 111575.

STATEMENT showing the Engineers, Firemen, Carpenters, Hoist Attendants and Watchmen employed at Dominion Public Buildings on 30th June, 1890.

Place.	Building.	Name.	Position.	Date of Appointment.	Salary per Month.	Time Employed per Annum.	Total Salary per Annum.
					£ s. d.		£ s. d.
Aberdeen.	N.S. Post Office.	James Morrison	Caretaker	November 2, 1890	33 33 12	12 months	400 00
Antigonish	" Public Building	H. P. Hill	do	March 1, 1887	8 75 12	do	45 00
Archieat	" Building on P. O. site	John McAskill	do	September 16, 1887	12 12 0	do	15 00
Bathurst	" Public Building	Alex. S. McDonald	do	December 25, 1886	16 07 12	do	200 00
Bathurst	" Dominion Building	John Powell	Engineer	October 1, 1871	62 50 12	do	750 00
Bathurst	" do	Richard Power	Fireman	do 1, 1871	70 00 0	do	450 00
Bathurst	" do	M. Sullivan	Caretaker	do 31, 1886	33 33 12	do	400 00
Bathurst	" do	John Dunn	Watchman	April 1, 1887	39 00 12	do	400 00
Bathurst	" Examining Warehouse	William Power	Caretaker	January 20, 1887	41 67 12	do	500 00
New Glasgow	" Post Office	Paul Mc Donald	do	October 1, 1889	33 33 12	do	400 00
North Sydney	" Public Building	Angus McEachern	do	January 20, 1888	33 33 12	do	400 00
Pictou	" Customs House	George Holman	do	do 31, 1888	33 33 12	do	400 00
Pictou	" do	Hugh McCulloch	do	September 22, 1888	33 33 12	do	400 00
Truro	" do	J. W. Smith	do	July 30, 1886	33 33 12	do	400 00
Yarmouth	" Public Building	Robert Speers	Engineer	December 25, 1886	33 33 12	do	400 00
Charlottetown	" P.E.I. Dominion Building	D. McLeod	Fireman	September 13, 1887	33 33 12	do	400 00
do	" do	A. B. Leed	Watchman	February 25, 1889	37 00 12	do	444 00
do	" do	A. B. Grant	do	January 19, 1875	37 00 12	do	444 00
do	" do	George Walker	Caretaker	do 12, 1885	10 00 12	do	120 00
Montague	" Public Building	Martin Lambert	do	November 5, 1885	33 33 12	do	400 00
Summerside	" do	James Beal	do	April 15, 1887	33 33 12	do	400 00
Eastport	" do	R. B. Adams	do	May 10, 1889	10 83 12	do	130 00
Charlottetown, St. John.	" do	James R. Reed	do	October 31, 1881	8 33 12	do	100 00
Fredericton	" do	James Perkins	do	do	33 33 12	do	400 00
Moncton	" do	E. B. Hicks	do	January 11, 1886	33 33 12	do	400 00
Newcastle	" do	Patrick Keating	do	October 25, 1887	33 33 12	do	400 00
St. Stephen	" do	Samuel Topping	do	May 19, 1883	33 33 12	do	400 00
St. John's	" do	Thomas Adell	do	October 19, 1883	33 33 12	do	400 00

St. John	Custom House	G. H. Jones	Engineer	17, 1880	60 00	12	do	720 00
do	do	Christopher White	Fireman	February	60 00	6	do	300 00
do	do	T. W. Shaw	Caretaker	November	41 67	12	do	500 00
do	Post Office	Henry Howe	Engineer	November	45 00	12	do	600 00
do	do	Ed. Hancy	Hout Attendant	do	45 00	12	do	350 00
do	Penitentiary	George Campbell	Caretaker	October	37 50	12	do	450 00
do	Post Office	William Kennedy	do	February	33 33	12	do	400 00
Que.	do	J. R. Woods	do	February	8 33	12	do	100 00
Quebec	Public Building	Isaac Baldwin	do	November	33 33	12	do	400 00
do	do	Thomas Paquin	do	June	16 46	12	do	300 00
do	Post Office, &c	Charles Gault	do	January	33 33	12	do	400 00
do	do	Thomas Gault	do	October	33 33	12	do	400 00
do	Dominion Buildings	Thomas Ryan	Foreman Engineer	15, 1889	85 00	12	do	1,020 00
do	Examining Warehouses	M. Boyer	Fireman	4, 1882	50 00	12	do	600 00
do	Post Office	John Watson	Engineer	4, 1882	65 00	12	do	780 00
Que.	do	L. D. Thibault	Electric Light and Hout Attendant	18, 1876	60 00	12	do	720 00
do	Inland Revenue	F. Greene	Engineer	1, 1885	60 00	12	do	720 00
do	Custom House	W. Wallace	Fireman	January	50 00	8	do	400 00
do	do	J. H. Marchand	do	October	50 00	8	do	400 00
do	Drill Hall and Armouries	Wm. McDonald	Engineer	1, 1882	45 00	12	do	540 00
do	Examining Warehouse	Jas. Matthews	Engineer	21, 1885	55 00	12	do	600 00
do	do	Wm. Stephens	Fireman	December	40 00	8	do	320 00
do	Culler's Office	John O'Neil	do	October	45 00	8	do	360 00
do	Custom House	John R. Mountain	Acting Fireman	8, 1886	45 00	12	do	540 00
do	Post Office	Thos. Rawson	Caretaker	November	33 33	12	do	400 00
do	do	P. St. Michel	do	December	33 33	12	do	400 00
do	do	Widow J. Fortin	do	September	16 66	12	do	200 00
do	do	Wm. Couper	Watchman	May	12 50	12	do	130 00
do	Public Building	Medard Grignon	Caretaker	December	58 33	12	do	700 00
do	Custom House	J. B. Gierin-Lajoie	do	March	33 33	12	do	400 00
do	Post Office	Jas. Carhamman	do	September	33 33	12	do	400 00
do	do	John Lovegrove	do	July	33 33	12	do	400 00
do	do	Wm. Sheppard	do	November	33 33	12	do	400 00
do	do	John Squires	do	5, 1885	50 00	12	do	600 00
do	do	Fred. Edwards	do	April	33 33	12	do	400 00
do	do	J. P. Reeves	do	October	50 00	12	do	600 00
do	do	Widow Aug. Meinke	do	27, 1880	50 00	12	do	600 00
do	do	Gilbert Campbell	do	March	33 33	12	do	400 00
do	do	Henry Dunn	do	17, 1883	33 33	12	do	400 00
do	do	W. W. Mitchell	Engineer	2, 1887	33 33	12	do	400 00
do	do	Thos. Murphy	Caretaker	October	50 00	7	do	350 00
do	do	J. H. Cameron	do	September	33 33	12	do	400 00
do	do	H. J. Payne	do	23, 1885	4 16	12	do	150 00
do	do	Wm. Kilgour	do	March	33 33	12	do	400 00
do	do	Robert Higham	do	April	33 33	12	do	400 00
do	do	Thos. F. Richardson	do	28, 1890	33 33	12	do	400 00
do	do	Wm. Hornby	do	September	8 33	12	do	100 00
do	Dominion Building	Thos. Beatty	do	25, 1886	50 00	12	do	600 00
do	do	Thos. Nicholson	Fireman	9, 1889	45 00	12	do	540 00
do	do	Wm. Harris	Engineer	7, 1887	50 00	12	do	600 00
do	Drill Hall	do	do	November	45 00	12	do	270 00
do	do	do	do	March	45 00	6	do	270 00
do	do	do	do	December	45 00	6	do	270 00

(APPENDIX No. 3)—STATEMENT showing the Engineers, Firemen, Firemen, Caretakers and Watchmen employed on Dominion Public Buildings, &c.—Continued.

Place.	Building.	Name.	Position.	Date of Appointment.	Salary per Month.	Time employed per Annum.	Total Amount Paid per Annum.
Kingsdon, Ont.	Military College.	Win. Johnson.	Engineer.	May 31, 1884.	\$ cts.	12 months.	\$ cts.
do	do	M. Madden.	Fireman.	October 12, 1888.	65 00	6 do	780 00
London.	Custom House.	M. Mulken.	Engineer.	September 12, 1888.	50 00	12 do	320 00
do	Post Office.	Win. Greer.	Caretaker.	March 16, 1884.	33 33	12 do	400 00
do	do	John Price.	Engineer.	January 14, 1889.	50 00	12 do	600 00
Lindsay.	Post Office and C. House.	Win. McLean.	Caretaker.	March 15, 1889.	33 33	12 do	400 00
do	do	John Hoan.	do	June 22, 1889.	33 33	12 do	400 00
Orangeville.	Post Office.	John Irwin.	do	September 15, 1889.	33 33	12 do	400 00
Peterborough.	do	Wm. Armstrong.	do	do 8, 1887.	33 33	12 do	400 00
Port Colborne.	do	Wm. Armstrong.	do	June 11, 1888.	20 00	12 do	240 00
Port Hope.	do	Levi Reynolds.	do	November 17, 1885.	33 33	12 do	400 00
Stratford.	Post Office, etc.	J. H. Roberts.	Engineer.	February 7, 1884.	50 00	12 do	600 00
St. Catharines.	do	W. Bryson.	Caretaker.	August 9, 1885.	33 33	12 do	400 00
St. Thomas.	do	Jas. Russell.	do	September 4, 1885.	33 33	12 do	400 00
Toronto.	Dominion Buildings.	J. A. Willis.	Fireman.	August 23, 1873.	125 00	12 do	1,500 00
do	Custom House.	Fred. Faragher.	do	November 1, 1889.	50 00	6 do	300 00
do	Inland Revenue Building.	Win. Woods.	Engineer.	October 5, 1889.	50 00	6 do	300 00
do	Examining Warehouse.	Jas. Cosgrave.	Fireman.	December 28, 1874.	65 00	12 do	780 00
do	do	Ed. Appleton.	Host Attendant.	September 23, 1886.	55 00	12 do	660 00
do	do	Alex. Day.	do	December 1, 1887.	50 00	12 do	600 00
do	do	Wm. Chery.	do	do 2, 1888.	50 00	12 do	600 00
do	do	W. J. Shean.	Watchman.	March 3, 1888.	46 50	12 do	558 00
do	Post Office.	Jas. Richardson.	Engineer.	September 3, 1885.	50 00	6 do	300 00
do	do	Henry L. Bell.	Fireman.	May 9, 1889.	50 00	6 do	300 00
Trenton.	Public Building.	Samuel Fitzgerald.	Caretaker.	November 31, 1889.	33 33	12 do	400 00
Windsor.	Post Office.	David Allau.	Engineer.	October 3, 1888.	50 00	12 do	600 00
do	do	F. Parker.	Caretaker.	November 9, 1889.	33 33	12 do	400 00
Winnipeg, Man.	do	W. Curtis.	Engineer.	June 1, 1888.	70 00	12 do	840 00
do	do	Patrick Dillon.	Fireman.	January 1, 1889.	45 00	6 do	270 00
do	do	Jos. Conlu.	Host Attendant.	March 16, 1887.	45 00	12 do	540 00
do	do	Ernest Lacom.	Watchman.	October 27, 1888.	45 00	12 do	540 00
do	do	Jos. Cauchon.	Caretaker.	June 12, 1887.	50 00	12 do	600 00
Prince Albert.	N. W. T. Court House and Gail.	George Northgraves.	do	do 14, 1888.	33 33	12 do	400 00
Nanaimo.	B. C. Post Office.	John Thompson.	do	November 10, 1883.	50 00	12 do	600 00
New Westminster.	do	John McMurphy.	do	October 1, 1884.	50 00	12 do	600 00

R. STECKEL.

APPENDIX No. 4.

REPORT

ON THE

HEATING APPARATUS, GAS, WATER AND BELL SERVICES, &c.,

IN THE

PUBLIC BUILDINGS, OTTAWA,

FOR THE FISCAL YEAR ENDED 30TH JUNE, 1890,

BY

JOHN R. ARNOLDI. Chief Mechanical Engineer.

APPENDIX No. 4.

Ref. No. 110,449.

DEPARTMENT OF PUBLIC WORKS,
MECHANICAL ENGINEER'S OFFICE,
OTTAWA, 31st July 1890.

SIR,—I have the honour to report as follows in reference to the Public Buildings, Ottawa, during the fiscal year 1890, viz. :—

PARLIAMENT BUILDINGS.

Ordinary maintenance only was required to the general apparatus of the heating, boilers, water, gas, bells, electric light and ventilating services of this building, during the fiscal year.

The making of a new caucus room in the west corridor of the Commons, necessitated a slight addition to the ventilating apparatus, as at times, the room was very crowded. Suitable alterations to the electric light were also made in this room, and the "Press," who were formerly located here, being moved to premises in the extreme north-west corner of the building, additional electric light wires and fixtures were provided in these premises also.

The room occupied by the *Hansard* being very limited, and the occupants very numerous, especially during night Sessions, it was found necessary to carry a large ventilator from this room through the roof to the outer air.

The changes created by the new caucus and press rooms, necessitated considerable alterations of the lavatories and many of the old style pan water closets, were replaced by modern sanitary appliances.

EAST AND WEST BLOCKS.

The heating apparatus, boilers, water, gas and bell services required nothing beyond ordinary maintenance.

The old style pan water closets, with which these buildings are fitted up, have been a great many years in use, and their present condition is not of the most desirable nature. Steps are being taken to replace them, as quickly as the work can be performed, with the most recent and approved sanitary appliances.

SUPREME COURT.

With the exception of an improved sanitary water closet, no work was required to be done in this building beyond ordinary maintenance.

OTTAWA POST OFFICE AND CUSTOMS HOUSE.

The water closets and lavatory of this building owing to want of space, are placed in very limited premises, and it was found necessary to carry large ventilators therefrom to the outside of the roof. Since this was done the atmosphere of the premises is much improved, and no complaints are heard.

This building contains a number of old pan water closets, which ought to be replaced by modern sanitary pattern.

The general apparatus of the building in heating, boilers, gas, water and bell services remain in an efficient condition.

GEOLOGICAL MUSEUM.

The general apparatus of heating, water, gas and bell services required no attention beyond ordinary maintenance during the year.

This building also being fitted up with pan water closets it will be desirable that they should be replaced with modern ones as early as possible.

FISH HATCHERY AND ART GALLERY.

Nothing was required to the general apparatus of this building beyond ordinary maintenance.

It having been decided to extend the apparatus for developing fish spawn to a larger extent than formerly, in this building, an extensive alteration to the water service and fixtures had to be made.

GOVERNMENT PRINTING BUREAU.

This building being in an exposed location, and the boilers carrying a moderately high pressure of steam, necessary for running the machinery, it was deemed advisable to construct the heating apparatus by the Mechanical Staff of this Department. This was done and the building satisfactorily heated in proper time last fall—the heating apparatus through the medium of a special pressure reducing valve being worked at 6 pounds of steam, taken from the machinery boilers carrying a pressure of 60 pounds.

Two steam elevators were constructed and placed in this building under the direction of this Department.

RIDEAU HALL.

Prior to the occupation of this building by His Excellency Lord Stanley, a wish was expressed that the drainage system should be examined by a sanitary engineer expert, which was acceded to. A thorough test was made in every possible way, with the most satisfactory results, proving the sanitary appliances to be in a reliable and satisfactory condition.

The general apparatus of heating, water, gas and bells required only ordinary maintenance.

GOVERNMENT COAL SHEDS.

The increased number and extent, lately, of the Dominion Public Buildings in the city of Ottawa, having materially added to the consumption of fuel, the Department were under the necessity for some years past of leasing additional coal shed accommodation at the Canal Basin. It was found impossible to enlarge the small shed owned by this Department, and there being no ground available in this vicinity on which to build a new one, the Department purchased, upon favorable terms, a large coal shed adjoining their own and gave up the leased premises.

This now gives ample accommodation for the yearly supply of coal.

INTERIOR DEPARTMENT (LEASED BUILDING).

Ordinary maintenance only was required to the heating apparatus in this building.

PARLIAMENT GROUNDS, FLOWER PROPAGATING HOUSE, PARLIAMENT GROUNDS, MAJOR'S HILL PARK.

No alterations or extensions having been made during the year to these premises, ordinary maintenance only was required to the heating apparatus, and hose required for sprinkling purposes, to any of the three foregoing.

I have the honour to be, Sir,

Your obedient servant,

JNO. R. ARNOLDI,

Chief Mechanical Engineer.

A. GOBEIL, Esq.,
Secretary, Dept. Public Works.

APPENDIX No. 5.

REPORT

ON

HARBORS AND RIVERS, DREDGES, DREDGING AND SURVEYS

THROUGHOUT THE DOMINION,

FOR THE FISCAL YEAR ENDED 30TH JUNE, 1890,

BY

HENRY F. PERLEY, Chief Engineer.

APPENDIX No. 5.

REPORT OF THE CHIEF ENGINEER.

Ref. No. 111643.

CHIEF ENGINEER'S OFFICE,
OTTAWA, 22nd September, 1890.

SIR,—I have the honour to submit herewith my annual report on the harbour works under my charge during the last fiscal year.

I have the honour to be, Sir,

Your obedient servant,

HENRY F. PERLEY,
*Chief Engineer.*A. GOBEL, Esq.,
Secretary, Public Works Department,
Ottawa.

PRINCE EDWARD ISLAND.

ANNANDALE PIER.

Annandale Pier is in King's County, and is situated on the north side of Grand River, near its entrance into Boughton Bay. It is distant 14 miles by road, south from Souris, the eastern terminus of the P. E. I. Railway, and is the shipping place for a large agricultural district.

The pier is one of those constructed by the Local Government and taken over by the Dominion Government, and consists of an approach 300 feet in length and 23 feet wide, with a pier head 140 feet long, averaging 36 feet in width. The approach, excepting a short open span which is planked over, is constructed of squared timber crib-work, filled in with brush, stone and clay. The pier head consists of four blocks of different shapes and dimensions, constructed of squared timber crib-work, and of pile work, the whole being covered over with plank.

It is not much exposed to the force of the sea, owing to the existence of a "bar" at the mouth of the river, but it is exposed to the running ice in the spring, and to the ravages of the teredo which is very destructive in the river.

Since its assumption by the Department it has received repairs, principally in close-piling along the face, and during the last fiscal year the sum of \$275.21 was expended in close-piling the western end for a distance of 15 feet, and the face for a distance of 70 feet, in placing 2,500 sup. feet B. M. of new plank, and in the renewal of three mooring posts.

BELFAST PIER.

Belfast Pier, Queen's County, is situated on the south side of Orwell Bay, about one mile distant from the village of Eldon. It was constructed about 20 years ago by the Local Government to accommodate the shipment of produce from the neighbourhood. Besides being an important shipping place, it is also a port of call

for the steamers of the P.E.I. Steam Navigation Co., plying during the season three times each week, between Charlottetown and Orwell Bay.

The pier is 600 feet in length and from 24 to 35 feet in width, with an L at the outer end, 105 feet in length and 20 feet wide, giving a channel face of 140 feet. Excepting two small openings, the work is constructed with square timber faces, the inner end for a distance of 390 feet, being filled in with brush, stone and clay, while the outer end and L are floored over.

Since its assumption by the Department, the outer end and L have been put in thorough repair.

During the last fiscal year, the sum of \$645 was expended in renewing the top of the inner end for a distance of 150 feet, which was very weak, owing to the natural decay of the timber.

CASCUMPEC.

Cascumpec Harbour, Prince County, is situated on the north coast of the Island, about 17 miles to the southward of North Cape, and about 20 miles to the north-westward of the entrance into Richmond Bay. The town of Alberton, the second one in importance in the county, is located at the head of the harbour and is a station on the P. E. I. Railway, which has a branch to the Railway wharf, where vessels can load and discharge.

The harbour is very extensive and perfectly safe with a depth of water sufficient to accommodate sea-going vessels, and it is sought as a harbour of refuge during easterly gales, principally by fishing vessels which are employed during the fishing season off the coast.

The entrance into the harbour is obstructed by two bars; the outer one composed of sand, lies about a mile from the entrance, and the inner bar, which is composed of very soft red sandstone, is between the beaches which form the entrance. The bars are about 1,000 feet in width, and carry a depth of ten feet of water at low water springs, which rise three feet.

It is proposed to make a cut through the inner bar, 100 feet in width, with a depth of 15 feet at low water, so as to admit of a larger class of vessels entering and leaving the harbour. It is thought that a deeper channel across the "inner bar," will have the tendency to create a stronger tidal current, and deepen the water over the "outer bar."

The work was commenced by the Department in 1885, by submarine blasting, and has been continued every season since, but, owing to the shortness of the period in which operations could be carried on, the softness of the material, which blasts badly, and the fact that the divers had to handle every piece of stone, it has not progressed as rapidly as it was expected.

During the last season a new plan was adopted by which the labour will be lessened, and the work can be completed in a few years at a moderate cost. It is to blast the rock as formerly and to have the dredge remove the same.

The sum of \$2000 was expended in ten weeks, and a cut of 620 feet in length, 35 feet in width and from 3 to 5 feet in depth was blasted across the bar, leaving some 4,000 cubic yards of material in place for removal by the dredge.

CHAPEL POINT PIER.

Chapel Point Pier, King's County, is on the south side of Grand River, about three miles from its entrance into Boughton Bay.

The pier was constructed by the Local Government and consists of an approach 200 feet in length and a block at the end 22 feet long, connected by a span $22\frac{1}{2}$ feet in length, making the total length of the pier $244\frac{1}{2}$ feet. The approach is constructed with squared timber faces and is filled in with brush, stone and clay, and the outer block is constructed also with squared timber faces, but it is filled with ballast and is, as well as the span, planked over.

On the 31st day of March ult., a contract was entered into for repairing the top of the existing work and for the extension of the pier by an addition of a new span and a new block, each being 22 feet wide and 22 feet in length, and at the end of the fiscal year the work was about half completed.

When completed the work will be 288½ feet in length, and it will admit of three small vessels loading at a time, instead of one, as at present.

CHARLOTTETOWN.

Charlottetown, the capital of the Province, is situated on a neck of land between the North and Hillsboro' Rivers, in Queen's County.

Early in the year the Departmental Dredge completed a channel 264 feet in length and 57 feet in width on the east side of the railway wharf.

CHINA POINT PIER.

China Point Pier is situated in Queen's County, and lies on the west side of the mouth of the Orwell River, at its entrance into Orwell Bay.

The pier was constructed by the Local Government to provide means for the shipment of produce, and to enable the steamers of the P. E. I. Steam Navigation Co. to call there. It is 426 feet in length on the south side, with a return along the channel face, 73 feet in length. It is from 18 to 24½ feet in width, and is composed of a series of 8 solid blocks (not including the approach), with intervening openings, spanned and planked over. The approach and the five inner blocks are built with squared timber faces, and are filled in with brush, stone and clay. The two outer blocks, and the one forming the **L**, are also built with square timber, but they, as well as all the openings, are covered with 3-inch plank.

In November, 1889, a contract was entered into for the removal of all flooring, cap-timbers, floor stringers and span beams, the raising of the outer block, the reconstruction of the top of the **L** block, and for the levelling up of the inner blocks and of the approach with stone and clay.

At the end of the fiscal year the work under contract was about half completed.

HICKEY'S PIER.

Hickey's Pier, Queen's Co., is situated on the south-eastern side of the East or Hillsboro' River, about 10 miles distant from the city of Charlottetown.

The Hillsboro' River, being navigable for a distance of about 15 miles inland from the city of Charlottetown, is the most important on the Island, and Hickey's Pier, since the channel at its end, and berths on each side of it, were dredged by the Department, is the first of importance on the river.

The structure was built by the Local Government, and is 428 feet in length, on its centre line, and is of different widths, ranging from 22 to 29 feet, the latter being the width of the outer end for a distance of 180 feet. It is composed of a shore abutment 105 feet in length, and of a series of blocks with intervening spans.

On its assumption by the Department, the pier was almost a wreck, and since that time several amounts have been expended upon its partial reconstruction.

During last season the sum of \$500 was expended in reconstructing the top of the second block from the outer end, in the renewal of its eastern face, and in placing new span beams and flooring in the opening between it and the outer block.

KIER'S SHORE PIER.

Kier's Shore Pier is situated at Malpeque, Prince County, and lies on the east side of Richmond Bay, about 7 miles from Kensington, a station on the P. E. I. Railway.

It was constructed by the inhabitants, assisted by the Local Government, and is 1,016 feet in length and from 20 to 24 feet wide. It is built with squared timber faces, filled in with brush and stone, and excepting a short span, 17 feet long, and

the outer end for a distance of 25 feet, which are planked, the top of the pier is covered with clay.

The amount authorized for expenditure last season, viz., \$100, has been expended in the partial renewal of the planking on the outer end, and in levelling up the top of the pier with brush, stone and clay.

LAMBERT'S PIER.

Lambert's Pier is at Montague village, King's County, and is situated on the southern side of Montague River, immediately below the highway bridge, and 6 miles above its entrance into Cardigan Bay.

Since the improvement of the channel by the Department, vessels of considerable size can ascend the river as far as Montague bridge, where the produce of a large and fertile tract of country is annually shipped.

It is one of the piers assumed by the Dominion Government in 1883, and its channel face has a total length of 310 feet. It consists of two sections, the upper or western being 140 feet in length and 24 feet wide, constructed of crib-work on the inside and of work on pile-bents on the outside; the lower or eastern section is 170 feet in length, 25 feet wide, and is constructed entirely on pile-bents. The pier extends along the edge of the channel, and runs parallel with the shore, to which it is connected by a road at the upper end, and the space between the pier and the shore is used as a ballast ground.

During the past season the sum of \$400 was expended in renewing the planking, in raising the lower end which had somewhat settled, and in raising the retaining crib-wall on the inside of the outer end, to prevent the deposited ballast from washing out.

MALPEQUE BREAKWATER.

Malpeque Harbour, Prince County, lies within the eastern or principal entrance of Richmond Bay, on the south shore of the Island, about 90 miles from East Point and 40 miles from North Cape.

During 1877-78-79 a breakwater, 600 feet in length, was constructed by the Department on the western end of the Royalty Sands, on the eastern side of the harbour, to shelter the anchorage from north-east winds and to afford a shipping place for the produce of the surrounding country.

Since the construction of the breakwater, as the sands inside of the breakwater were being wasted by the action of the sea during easterly storms, a breastwork was constructed from the inner end of the breakwater to Royalty Point, a distance of 2,370 feet.

The bottom of the outer end of the breakwater, which rested on sand, has been gradually settling for some years, while its top was kept up in position by close piling, which had been placed around it.

During last season the sum of \$1,000 was expended in the removal of the top of the wrecked end for a distance of 6 feet, in the removal of 30 feet in length of the top of the piece adjoining to a depth of 4 feet, in the reconstruction and raising of the 30 feet, and in close-piling the new end, and 10 feet on each side of it.

NEW LONDON.

The harbour of New London, or Grenville Bay, is situated on the northern coast of Prince Edward Island, about 10 miles south-east from the entrance into Richmond Bay. Within its entrance, which is about 1,200 feet wide, the bay is 3 miles wide, and receives the waters of the South-West, the French, the Stanley and the Hope Rivers.

The works constructed by the Department for the improvement of the entrance into the harbour consist of a breakwater, 1,050 feet in length, on the sand beach at the eastern side of the entrance, built partly of piling, brush and stone and partly of crib-work; a breakwater, 460 feet in length, on the beach at the western side of the

entrance, the inner end for a distance of 400 feet consisting of pile, brush and stone work, and the outer end being a squared timber block; and of a dam, 1,600 feet in length, off Campbell's Point.

The breakwaters were constructed for the purpose of confining the ebb current and direct it on to the sand bar outside, with a view of obtaining a better depth of water over it, and the results have been very satisfactory, the depth of water on the bar having increased from 6 to 12 feet of water at high water.

During the past season portions of the work on the east side of the entrance were reballasted, and materials were procured for the extension of the work at the inner end, a distance of 82 feet, and for the construction of a crib-work block between the two outer blocks.

NORTH RUSTICO.

North Rustico, Queen's County, is the most important fishing station on the northern coast of the Island, and is nearly equi-distant from North Cape and East Point.

During the years from 1881 to 1884 the Department constructed breakwaters on each side of the entrance to the harbour, for the purpose of concentrating the ebb current upon the bar outside, so as to scour away the sand, and thus obtain a greater depth of water over it. The results have been most satisfactory, as the depth of water on the bar has been increased by 3 to 4 feet, which, added to the former depth, gives at present, at low water springs, from 9 to 10 feet of water, and at high water from 12 to 13 feet.

The breakwater on the north side of the entrance, which is the most important, was originally 1,240 feet in length, but owing to the wrecked condition of the outer end, it has been deemed advisable to cut it off for a distance of 17 feet. The seaward face of the breakwater is constructed, down to 1 foot above low water, with a slope of 1 to 1, which is covered by 6-inch plank; below that the face is built of squared timber and plumb, and is close-piled.

During the past season a small sum was expended in replacing several pieces of plank on the sloping face, and of several piles on the bottom of the sloping face.

The dredge "Prince Edward" operated here during the year, opening a channel through a bar in the harbour to a depth of 11 feet at low water springs. A point was also removed from the south side of channel inside the bar. A middle ground in channel off De Rosher's fishing stage and one in front of Laird's wharf were also dredged.

PINETTE.

Pinette Harbour, Queen's County, is on the north side of Northumberland Strait, four miles east of Point Prim, and twelve miles north of Wood Islands. It is situated at the mouth of Pinette River, and extends about two and a half miles inland to Pinette Bridge; the navigable channel being 200 feet at the upper end, to 600 feet wide at the lower end, and carrying a depth of water of three fathoms at low water springs, which rise 8 feet.

A pier, 120 feet in length and 28 feet wide, was built on the south side of the channel, below and at right angles to Pinette Bridge, by the Local Government, and connected with the bridge by a span 28 feet long, planked over.

The pier is built along the channel, and has a frontage, including the span, of 148 feet. During 1881, the dredge "Prince Edward" operated in deepening the loading berths off the face of the pier, to 8 feet below low water springs.

As the tide flowing through the opening and the pier, carried with it a certain amount of sand, which was deposited in the channel to the detriment of its depth, during the past season the sum of \$250 was expended in the construction of a brush and stone dam to prevent that action, and in placing fifteen fender piles along the channel face of the pier.

PORT SELKIRK.

Port Selkirk Pier, Queen's County, is on the south side of the mouth of the Orwell River, at its entrance into Orwell Bay. It was constructed by the Local Government, and is in the form of a **T**, its length from the shore to the channel face being 252 feet, and the length of the pier-head was originally 248 feet; the width of the approach is 23 feet, and that of the pier-head 35.

On the assumption of this pier by the Dominion Government, it was in a wrecked condition and some urgent repairs were made, and since then several amounts have been expended upon it, but as the grants were not sufficient to reconstruct it, and the upper block was in danger of tumbling into the channel, it was removed together with the span connecting it with the west block, thus lessening the length of the channel face by 48 feet.

During last season the sum of \$987.52 was expended in tearing down and reconstructing the top of the upper block, to a depth of 12 feet, in the renewal of floor-strings and planking on 144 feet of the pier-head, and on 35 feet of the outer end of the shore abutment, and in placing fender piling, 5 feet apart, on the channel face and upper end of the reconstructed upper block.

POWNAI.

Pownal Pier, Queen's County, is situated at the head of Pownal Bay, the north-eastern corner of Hillsboro' Bay, and is distant about 9 miles from the city of Charlottetown.

The pier was built by the Local Government and is 753 feet in length. It consists of a shore abutment, 209 feet long and 16 feet wide, and of 14 blocks with intervening spans. The inner blocks are from 16 to 18 feet wide, and the two outer are 40 feet wide.

To admit of boats and small craft coming to and leaving the pier at all times of tide, the Department, during 1880-81, dredged a channel up to the pier, 1,275 feet in length, 56 feet wide and 5 to 6 feet in depth, carrying a depth of from 6 to 9 feet of water at low water springs, and a basin on the eastern side of the end of the pier, 90 feet wide and 250 feet in length.

During 1888-89 the span beams were renewed, nine of the spans were re-planked and some fenders were placed on the inner face of the two outer blocks.

During the past season the approach and the inner blocks were raised and levelled up with stone and clay.

RED POINT.

Red Point wharf, Queen's County, is on the south shore of the East River, about 5 miles above Charlottetown.

A basin was dredged at the end of the wharf for the accommodation of steamers and vessels.

ST. MARY'S BAY.

St. Mary's Bay Pier is situated on the south side of St. Mary's Bay, which forms the extreme southern end of Cardigan Bay, and is about 6 miles south of Georgetown, the shire town of the County of King's.

The pier is 407 feet in length, and its width is, for a distance of 330 feet, 21 feet, the outer end being from 28 to 29 feet wide, and is composed of a shore abutment and 7 blocks, with intervening spans. It was constructed by the Local Government, and was originally only 16 feet wide for a distance of 330 feet, and as it was found too narrow for the traffic, it was widened to 21 feet for a distance of 288 feet by constructing a narrow timber block, 5 feet wide along its eastern face; the remaining 42 feet was widened by simply placing a heavy hemlock stringer 16 by 6 inches across the span, and by planking over the additional width. The western side of the span is supported by a small block 10 feet long and 16 feet wide.

During last season the sum of \$160.56 was expended in the widening of the small block under the long span, to the width of the outer end blocks, viz., 29 feet, and in the renewal of the planking for a distance of 44 feet.

SOURIS.

Souris Harbour, Colville Bay, King's County, is about 16 miles to the westward of East Point, the eastern extremity of the Island. It is the principal place for shipping at the eastern end of the Island, and is a terminus of the Prince Edward Island Railway.

The anchorage being good and safe with the wind from the north, the Department constructed a breakwater in extension to the one previously built by the Local Government, off Knight's Point, on the eastern side of the harbour, to afford shelter during southerly storms, and thus form a harbour of refuge.

The breakwater is at present 1,180 feet in length, including the portion constructed by the Local Government, which is 270 feet long. The inner portion (270 feet long) is 25 feet wide, with faces plumb, the centre portion is 500 feet in length and 46 feet wide, with faces plumb, and the outer portion is 410 feet long and 21½ feet wide on top, with sides sloping 1 in 6.

It is exposed to the full force of the sea during southerly gales, and to the attacks of the teredo, which is very destructive along this coast, and since its construction it has required partial reconstruction and very extensive repairs. The end stands in 54 feet of water at low water springs, and being rather narrow for its height (21 feet on top and 30 feet high), the top was moved some 3 feet inwards by the force of the sea. To protect its weakened face, on the seaward side, and to prevent the top from further moving, a heavy stone slope along its seaward face was commenced by the Department during 1888, and at the same time a strongly constructed timber block, 30 feet square on the bottom and close piled all around, was placed at the outer end of the seaward face, to prevent the stone from moving around the end.

During last season the sum of \$1,299.91 was expended in reconstructing the top of the outer end for a distance of 110 feet, to a depth of 5 feet, in close-piling some of the weakest portions of the seaward face, aggregating a distance of 90 feet, in placing 430 cubic yards of stone in the top of the work, where mostly needed, in placing 392 cubic yards of heavy stone along the seaward side, and in placing 12 fender piles on the inner face of the outer end.

SOUTH RIVER.

South River Pier, King's County, is located at the head of navigation on the South River, the southern inlet into Murray Harbour. It was constructed by the Local Government, and extends out into the river for a distance of 90 feet; it has an L at the end, with a water frontage of 108½ feet. It is from 21 to 23 feet in width, and is composed of four blocks with intervening openings, spanned and planked over. There is a depth of 8 feet of water, along its front, at low water springs, this depth increasing from 9½ feet at 10 feet from the face. Spring tides rise 5½ feet. The inner block, or shore abutment, is 47 feet in length, the inside portion for a distance of 27 feet being built up with brush and stone, the outer consisting of a solid timber block, 20 feet in length. The three channel blocks, each 25 feet in length, are constructed of round timber in the bottom and of squared timber in the top.

During 1887-88 the blocks were raised and ballasted, stone and clay were placed in the shore abutment, new span beams and planking were laid on the spans, and a new cap was placed around the whole structure.

During the past season 30 fender piles were placed around the outer blocks.

SOUTH RUSTICO.

South Rustico Pier, Queen's County, is situated immediately below the Oyster Bed Bridge, at the mouth of the Whately River, which enters Rustico Bay at its

southern end. It is distant about 6 miles from Hunter River station, on the Prince Edward Island Railway, about 13 miles to the northward of the city of Charlottetown.

A channel 600 feet long by 144 feet wide was opened from the main channel to the wharf, and a loading berth, 90 feet by 45 feet, was dredged.

STEVEN'S PIER.

Steven's Pier is at Montague, King's County, and is situated on the southern side of the Montague River, immediately below Lambert's Pier, and 6 miles above its entrance into Cardigan Bay.

Since the improvement of the navigable channel of the river by the Department, vessels of considerable size can ascend the river as far as Montague Bridge, where a large amount of produce is yearly shipped.

The pier consists of two wings, about 50 feet apart, extending out from the shore, with a pier-head at the outer end, 100 feet in length along the channel. The wings consist of shore abutments, 90 and 115 feet in length, respectively, built with squared timber faces and filled in with stone and gravel, next, of openings, 21 and 30 feet in length, spanned and planked over; squared timber blocks form the outer ends of the wings. The pier-head is constructed on pile bents, spanned and floored over.

On the assumption of this pier by the Department, the pier-head was reconstructed and the weakest portions of the approaches were repaired.

During the last year the sum of \$199.98 was expended in reconstructing the western face of the western shore abutment, which, owing to old age and decay, was in a dangerous condition.

NOVA SCOTIA.

ARISAIG.

Arisaig, Antigonish County, is on the south-east shore of Northumberland Strait, 15 miles to the eastward of Merigomish, the nearest harbour.

A pier commenced by the Government of Nova Scotia about 47 years ago, came under the charge of the Federal Government in 1870. It was put in thorough repair in 1873, and small amounts were expended in 1880 and 1881 in repairing damage caused by ice.

A contract, entered into in 1886, for repairs to the pier and for the construction of a breakwater on the eastern side of the harbour, was completed in 1888.

At the time of the completion of the works referred to, the pier was 440 feet in length, consisting of an approach and an outer portion 195 feet in length and from 40 to 44 feet in width. There was, at extreme low water, a depth of but 1 foot along its inner face, over a distance of 100 feet from the outer end, and over the area sheltered by it, nowhere more than 3 feet.

The breakwater is 300 feet in length and 20 feet in width, on top, and has an L at its outer end 40 feet in length. The depth at its outer end at extreme low water is 6 feet; spring tides rise 5 feet.

During the year 1889-90 the work of extending the pier 100 feet and protecting its seaward face by a deposit of heavy stone, the contract for which was entered into the previous year, was commenced and nearly completed.

The extension is founded in from 10 to 8 feet at extreme low water on a bottom prepared by one of the Department dredges. After the completion of the excavation for the foundation, a cutting about 70 feet in width was carried along the inner face of the extension, and of the pier over a distance of about 130 feet from its outer end.

BARRINGTON.

Barrington, Shelburne County, is distant 45 miles to the south-east of Yarmouth and 30 miles south-west from the town of Shelburne and is within 10 miles of Cape Sable, the most southerly point of Nova Scotia. The settlement is a straggling one and covers a distance of about 3 miles; the upper part being known as "the Head" and the lower the "Passage." It is a port of call for the line of steamers running between Halifax and Yarmouth and is the terminus of the steam ferry to Cape Sable Island.

At present the only wharf at Barrington at which steamers can land is a private one at the lower part of the Passage and this is not available at low water on account of a bar distant 1,200 feet from the end of the wharf, on which there is only 4 feet of water at low tide.

In 1888 an examination was made of the different sites in the neighbourhood to ascertain which was most suitable for the construction of a public wharf and one was selected near the head of Sherose Channel as being the most central and sheltered, and having at the same time a sufficient depth of water.

The site is on the western side of Sherose Channel, at a point where it most closely approaches the mainland, and to reach this channel it is necessary to cross 960 feet of flats which are just bare at low water, at which time there is 12 feet in the channel. Spring tides rise at Barrington 9 feet.

The construction of the wharf was begun in 1888-89 and during that year the amount of \$3,000 was expended. Work was continued during the present fiscal year during the first half of which the sum of \$1,000 was used in extending the work, and during the last half an additional \$50 in storing and protecting some materials left over from the previous season's operations.

The wharf when completed will consist of: first, an inshore section 90 feet long, constructed entirely of stone; secondly 135 feet of cribwork to the beginning of the mud flats, thirdly 735 feet of pile wharfing to the edge of the channel (these three sections being all 20 feet wide); and lastly, a cribwork channel block for the steamers, &c. to lie at, 30 feet wide and 70 feet long.

At the close of this year's operations the first and second sections were completed, 300 feet of the pile work was finished and enough material on hand and stored away to complete an additional 250 feet of pile work and plank covering to reach the channel block.

The dredge "Canada" during the year dredged a basin for the proposed wharf, removed the points in and deepened the channel to 11 feet, and a channel was also opened from the main one to Sargents' wharf.

BIG LORRAINE.

Big Lorraine, Cape Breton County, is a small harbour on the east coast of Cape Breton Island, 3 miles north-east of Louisburg Harbour.

During the year 1889-90 the amount appropriated was expended in opening a straight channel through the western extremity of a bar obstructing the entrance.

The new channel is 20 feet in width and has a depth, at extreme low-water, of 2 feet. Spring tides rise 5 feet.

The old channel, at the eastern extremity of the bar, is narrow and intricate.

BIG TRACADIE.

At the close of the fiscal year, one of the Departmental dredges was engaged at Big Tracadie, Antigonish County, in improving the channel, the material removed being principally clay.

CHETICAMP.

Cheticamp Harbour, Inverness County, is on the west coast of Cape Breton Island, 18 miles north from Margaree Harbour.

It is a secure harbour, being sheltered from the west and south by Cheticamp Island and a connecting beach. The entrance is from the north through a dredged channel.

There are several large fishing establishments, the principal one being that of Messrs. Robin & Co., of Jersey.

During the summer, regular steam communication is maintained between Pictou and intermediate ports.

A contract was entered into 10th June, 1889, for the construction of a wharf on the eastern side of the harbour; to consist of an approach 125 feet in length, and 30 feet in width over a distance of 60 feet from its outer end, with side walls of stone and centre filling of earth or stone; and an extension 80 feet in length, in two blocks, with openings of 17 feet 6 inches. The outer block is to be 60 feet in length along the channel face, and to have a depth of 11 feet at extreme low water.

The approach was completed in April. At the close of the year ended 30th June, the outer blocks were in place and partially ballasted.

CHURCH POINT.

Church Point, Digby County, is situated on the south shore of St. Mary's Bay, directly opposite Petit Passage, and is about 8 miles south of Weymouth.

The breakwater which is one of the most important in St. Mary's Bay, was begun about 50 years ago by the inhabitants and local authorities, and has been extended and improved on several occasions since that date. In 1875-76 the Department expended the sum of \$2,000, the inhabitants contributing a similar amount, in repairing the northern face and constructing an L, 72 feet by 20 feet at right angles to it, to prevent the gravel from working round the outer end.

During the present year a small amount was expended in placing some new fenders at the loading berth, and in other slight repairs.

COW BAY.

Cow Bay, Cape Breton County, is on the eastern coast of Cape Breton Island, about 18 miles north-east of Sydney Harbour. Owing to the extensive coal mines in its vicinity, it is a place of considerable importance.

The bay is $2\frac{1}{2}$ miles wide at the mouth, and being completely open to the Atlantic Ocean, affords no safe anchorage during easterly gales.

A breakwater was built some years ago on the north side of the bay, by Messrs. Archibald & Co., proprietors of the Gowrie Mines, with some aid from the Government of Nova Scotia. It is 1,386 feet in length and was originally about 44 feet in width, with a depth at the outer end, at low water, of 20 feet. The area of the basin enclosed between it and the loading pier of the Gowrie Mines, is about 17 acres, 10 acres of which had originally a depth of from 9 to 20 feet at low water. Spring tides rise 5 feet.

In 1873, while repairs were in progress by the Department, the breakwater was seriously damaged by the great gale of 24th August. After the gale, operations were resumed, the balance of the amount appropriated being largely supplemented by Messrs. Archibald & Co.

In 1874, Messrs. Archibald & Co.'s interest in the breakwater was acquired by the Federal Government, and a contract, entered into in May, 1875, for repairing and strengthening the structure, was completed in July, 1877.

Extensive repairs have been made nearly every year since 1877, and the work has been strengthened by the addition of counterforts and outer face works, and by close-piling.

The breakwater now consists of an inner work, extending from within 220 feet of the shore end to the outer end, with counterforts and connecting works on the seaward side, from within 580 feet of the shore end to the outer end. The outer and inner works are from 22 to 25 feet apart; they are connected at intervals by tie-walls, and the spaces are filled in with earth and stone ballast.

During the year 1889-90, the amount appropriated was expended in repairs to the seaward side of the breakwater, and in close-piling a portion of its inner face.

Some dredging was done at Messrs. Archibald & Co's. wharves, which was paid for by that firm, and a cut 900 feet long, 25 feet wide and from 10 to 17 feet deep, was made along the side of the breakwater.

Below are given statements of the amounts collected from breakwater dues and the number of vessels entered and cleared, and the exports during the year 1888-89:

Breakwater dues and wharfage	\$1,863 00
Collected by Harbour master	143 00
Paid to sick mariner's fund	158 62
	<hr/>
	\$2,164 62

Entered and cleared—Steamers	79
Brigs	19
Schooners	578
	<hr/>
	676

Exports—Coal	108,710 tons,
Codfish	2,000 quintals,
Pickled fish	2,000 barrels,

DIGBY.

The town of Digby is situated at the western end of Annapolis Basin, and is the eastern terminus of the Western Counties Railway. It is a port of call for the steamers running between Annapolis, St. John and Boston, and does a considerable coasting trade, principally in the transshipment of fish. The harbour is open at all seasons and the pier which stands at the northern end of the town acts as a breakwater to the smaller wharves and is the only wharf in the place accessible at low water.

The outer end of the pier was destroyed by storm in December, 1885, and was re-built by the Department during the years 1888 and 1889, at an expenditure of \$8,863.01.

The pier consists of an inshore section of pile work 560 feet long and 27 feet wide, this part of the structure is built entirely on pile bents and is protected by a row of close-piling on its northern or seaward side; it was not materially injured by the storm referred to above, but it is old and much worm-eaten. The second section of the pier is a close-faced crib-work block, 80 feet long and 40 feet wide; this block was damaged though not destroyed by the December storm and the repairs effected during the present fiscal year were confined entirely to this block. The remaining portions of the pier are new and consist of a cribwork inclined landing 180 feet long and 25 feet wide, over which there is constructed a deck wharf on framed bents, and finally an outer block 45 feet by 45 feet of round cribwork which forms the outer end of the pier.

The damaged centre block above referred to was shifted bodily by the storm so that its south-east corner projected 13 feet beyond the south line of the wharf. This projecting corner was cut away and removed when the outer end of the pier was rebuilt. During the present fiscal year the sum of \$392.91 was expended in driving heavy piles along both the northern and southern sides of this block to prevent any further movement.

Spring tides rise 27 feet 6 inches and leave the beach bare to the head of the inclined landing. There is now 12 feet of water at low tide at the end of the pier.

EAST BAY.

During the year 1889-90, a site was selected and a wharf built in Cape Breton County, on the north side of the East Bay of the Bras d'Or Lake, half a mile to the

westward of McAdam's Point and $5\frac{1}{2}$ miles to the westward of the head of the bay. The distance to Sydney is $17\frac{1}{2}$ miles and to the nearest station on the Cape Breton Railway $10\frac{1}{2}$ miles.

The wharf is 220 feet in length and 20 feet wide, with a return of 20 feet at the outer end, giving channel or end face 40 feet in length. It consists of an approach of brush and stone 50 feet in length, and five blocks, with openings of 17 feet 6 inches. The depth at the outer end is 10 feet at the lowest lake level, or 11 feet 3 inches at extreme high lake level.

EAST RIVER.

East River, Pictou County, empties into Pictou Harbour, below New Glasgow. It rises near the headwaters of the St. Mary's River, and flows through a fine agricultural district. A large quantity of timber is cut annually and brought down during the spring freshets.

In 1886-87, a number of ledges and boulders which interfered with the passage of timber in a section of the river extending 10 miles above Springville, were removed: and in 1888-89 a section, 1 mile in length, commencing at a point $2\frac{1}{2}$ miles below Springville, was improved by removing boulders and cutting passage through a succession of ledges.

During the year 1889-90 the amount appropriated (\$500) was expended in removing boulders and in cutting through points of ledges between the section improved the previous year and Eureka.

The distance from New Glasgow to Eureka and Springville are respectively six and eleven miles.

The "St. Lawrence" dredged from the main channel to the City Market Wharf, and at the close of the fiscal year had opened a channel 150 fathoms in length, 45 to 50 feet in width, to a depth of 15 feet at low water.

EATONVILLE.

Eatonville Harbour, formerly known as "The Three Sisters," Cumberland County, is about 10 miles north of Cape Chignecto, Bay of Fundy, and 4 miles south-west from Apple River Harbour.

The harbour is formed by a sand beach at its mouth, which extends from the high land on the south side, a distance of about 600 feet, and its end is within about 120 feet of the rocky cliff on the north side. Between the end of the beach and the cliff flows the stream, and the tide which runs inland, about half a mile, covers, at high water, a large expanse of marsh.

Large vessels, up to 1,200 tons, can run into the harbour at high water, and there load lumber for the English market, or undergo repairs, if such are required.

Spring tides rise 37 feet; neaps rise 30 feet.

During 1887-88 a breakwater was constructed by the Department, off the northern end of the sand beach, to prevent the accumulation of gravel in the mouth of the river and to protect the end of the beach, which during freshets was often damaged, endangering the stability of the harbour.

During 1888-89 an extension, 80 feet in length, was commenced, and it was built up to a height of 15 feet at the outer end, and its inner face and end were close-piled to prevent scouring out of the gravel bed underneath, when the work was visited by an extremely heavy gale, which cut away the gravel bank at the inner end of the breakwater, and undermined its inner face, causing the work to cant inward. Operations on the extension were stopped at once, and the balance of the amount appropriated was expended in securing the inner end of the breakwater by the construction of protection works.

During the past season the top of the breakwater constructed during 1887-88 was cut down to the level of the extension, and its inner face was close-piled. The new top was built simultaneously with the extension, a distance of 203 feet, and the whole work was completed in a very satisfactory manner.

The total length of the breakwater is 223 feet, and its width on top is 20 feet, sloping about 1 in 6 on the seaward face and end. It is constructed of round timber crib-work, roughly put together and fully ballasted, and its inner face and the end are close-piled. Its average height is 20 feet.

Since its completion a large amount of gravel was scoured out of the bottom of the river's mouth by the current, increasing considerably the depth of water in it, and thus permitting vessels a longer period during each tide in which to enter or leave the harbour.

ECONOMY.

Economy, Colchester County, is situated on the west side of the Basin of Minas, 20 miles west of Great Village, and 20 miles east from the town of Parrsboro', the terminus of the Cumberland Coal and Railway Company's Railway.

A wharf, to serve as a breakwater at the same time, was constructed by the Department, during 1887-88. It is 208 feet in length, 25 feet wide on top, with an average height of 11 feet.

During the past season, it has been extended 100 feet in length, 25 feet wide, on top, with an L on the eastern side of the outer end, 25 feet in length and 25 feet in width, with sides and end sloping 1 in 16. The work throughout, with the exception of cap timbers, floor-stringers, fenders and covering, is constructed of round logs. All faces are double fendered, two ballast floors have been placed, and on them ballast to depths of 4 and 3 feet, has been laid. Six mooring posts, eight ring-bolts and two ladders, have also been placed. The top of the work is 3 feet above high water mark springs, and its average height is 18½ feet.

The total length of the wharf is at present 308 feet, with a depth of 15 feet of water at its outer end during high water spring tides.

Spring tides rise here 46 feet; neaps rise 39 feet.

FRENCH COVE.

French Cove, Victoria County, is on the east or Atlantic coast of Cape Breton Island, about mid-way between Neil's Harbour and White Point.

During the summer months, eleven boats from Ingonish and the Bras d'Or Lake, engage in fishing at this station.

The amount appropriated for the year 1889-90, was expended in improving the landing place for boats, by the removal of rocks and boulders.

GREEN COVE.

Green Cove, Victoria County, is a small fishing station on the east or Atlantic coast of Cape Breton Island, about mid-way between North Ingonish and Neil's Harbour.

During the summer months, some six or eight boats engage in fishing at this place.

The amount appropriated for the year 1889-90, was expended in improving the landing place for boats, by the removal of bedded rocks and boulders, over a distance of 60 feet, measured along the shore, in a small cove slightly sheltered by a reef and by projecting ledges.

GROSSES COQUES.

Grosses Coques, Digby County, is situated at the mouth of a small river emptying into the St. Mary's Bay, about seven miles to the westward of Weymouth.

The pier at this place was built many years ago by private subscription aided by grants from the Local Government. For the last ten or twelve years, little or no repairs having been made the river face of the structure became much dilapidated, and parts of it fell into the stream rendering the pier quite useless for shipping purposes.

An appropriation of \$3,000 was made during the session of 1888-89 for repairing the face of this pier, the inhabitants agreeing to assist by subscribing certain materials and labour gratis, and during the past year the entire river face of the pier as well as the eastern breakwater have been rebuilt.

The eastern breakwater was rebuilt wholly by the inhabitants and is a light piece of work, constructed many years ago to confine the river mouth and prevent any undertow at the loading berths.

The new river face of the main pier is built of large size round timber, is 628 feet in length, and at the outer end 20 feet high, decreasing in height to 15 feet at the inner end.

The new face is of various thicknesses owing to the old work being found sounder in some places than in others, but it is all constructed in the same manner with cross-ties and fenders at 8 foot centres and two ballast floors throughout. On top it averages 22 feet in width and has three sets of longitudinal timbers, on the bottom it is somewhat less, the cross-ties being run in and secured to the old work wherever this latter was found sound enough.

The whole amount of the appropriation has been expended and all the timber work is done and the work completed in every way, except ballasting on the upper floor for about half the length of the structure.

JONES HARBOUR.

Jones Harbour is situated on the eastern side of the mouth of Sable River, and is situated by water about 12 miles east of Lockeport.

The harbour is small but well sheltered, having from 9 to 12 feet of water in the channel at low tide; it is much used by boat fishermen in the fall when the larger vessels have returned from "the banks." There is a strong tide in the harbour at certain times, and in 1888 the Department expended the sum of \$50 in placing 3 ring bolt moorings so that the fishermen could secure their boats in safety.

During the present fiscal year a landing wharf and breakwater have been constructed inside the mouth of the harbour to enable the fishermen to use a larger class of boats and also to give them landing facilities.

The wharf is 175 feet long and consists of an inshore end 90 feet long and 15 feet wide, built of large stone; a centre portion of cribwork which is the same width and 45 feet long, and an outer or channel block 40 feet long and 20 feet wide, also of cribwork. The cribwork sections are of round timber, ballasted with large stone, fendered on all outside faces and have their surfaces covered with 3 inch plank. Spring tides rise 7 feet and there is 9 feet of water at the outer end of the wharf at low tide.

LISMORE.

Lismore, Pictou County, is on the Northumberland Strait, 10 miles to the eastward of Merigomish, the nearest harbour, and the same distance from Merigomish Station on the Eastern Extension of the Intercolonial Railway.

A wharf was commenced in 1886-1887 and completed the following year. It is 200 feet in length and 20 feet wide. It is strongly constructed, full ballasted and close fendered at the outer end. The depth at the outer end at extreme low water is 1 foot 9 inches. Spring tides rise 4 feet 6 inches.

During the year 1889-90 the amount appropriated was expended in completing the work (commenced the previous year) of deepening to 1 foot 9 inches at extreme low water through a reef extending from 5 to 20 feet beyond the outer end of the wharf, the depth over which was originally 9 inches at extreme low water.

LOCKEPORT.

During the year two of the Departmental dredges operated at different times at this place, which is situated on Rugged Island Harbour, Shelburne County, improving the navigation generally and giving a depth of 10 to 12 feet, except where rock was met.

MABOU.

Mabou Harbour, Inverness County, is on the west coast of Cape Breton Island, 6 miles north east from Port Hood.

The entrance was formerly at the southern extremity of a range of sand hills by an intricate channel obstructed by a bar over which there was a depth of only 4 feet at low water.

In 1870, a survey was made, and a report submitted on the project of opening a new channel through the sand hills at their northern extremity, and closing the existing channel.

The work was commenced in 1872—a pier, on the south side of the new channel, 753 feet in length, was completed in 1876 and the same year the old channel was closed. Expenditures have been made nearly every year since 1876, in constructing a brush and stone dam on the south side near the outer end of the pier; constructing and repairing a breast work on the north side; repairing the pier and protecting it by close-piling; and since 1885, in constructing a work of brush and stone in shoal water on the south side of the channel, extending 1,112 feet beyond the outer end of the pier.

The amount appropriated for the year 1889-90 was expended in increasing the height of the brush and stone work.

The new channel is straight and in every way a great improvement on the former entrance, which is now closed by a sand bar from 900 to 1,000 feet in width. The depth at low water in the new channel, opposite the outer end of the brush and stone work, is 7 feet; beyond this there is a short bar covered with 6 feet at low water. In the channel from the outer end of the brush and stone work to the outer end of the pier, the depth varies from 8 to 12 feet, and opposite the pier, where it is about 100 feet wide, from 12 to 15 feet at low water. From the inner end of the pier there is a channel 4,000 feet in length, expanding into a fine basin $2\frac{1}{2}$ miles long and from a quarter to half a mile wide, inside the 10 feet lines, and having a depth of from $2\frac{1}{2}$ to 4 fathoms over a large part of its area.

At the close of the fiscal year the "Canada" was engaged in deepening to 12 feet at low tide, and widening the channel through the sand bar at the entrance to the harbour.

MAIN À DIEU.

Main à Dieu, Cape Breton County, is a small harbour on the eastern coast of Cape Breton Island, 10 miles north-east from Louisburg. It is sheltered by Scatarie Island and by reefs in the bay between it and the mainland, and affords a safe anchorage for small coasting and fishing vessels, by whom it is much frequented, in from 10 to 13 feet at low water. Spring tides rise $5\frac{1}{2}$ feet.

A point 240 feet long, 100 feet wide near the breakwater, was cut off by a dredge, to a depth of 13 feet. A portion of the middle ground was also removed.

MARGAREE.

Margaree Harbour, at the mouth of the Margaree River, Inverness County, is on the west coast of Cape Breton Island, about 30 miles north-east of Port Hood. It has a narrow and intricate channel, through which the tides run at the rate of four knots, and its entrance is obstructed by a bar of shifting sand over which there is at times a depth of only 5 feet at extreme low water. Spring tides rise 4 feet.

A pier constructed on the west side of the entrance to the harbour by the Provincial Government, prior to Confederation, was repaired and extended by the Department in 1876, and again in 1879.

During the year 1889-90 a contract was entered into for repairs to the pier and for an extension 200 feet in length, 20 feet in width on top, over a distance of 170 feet, and 25 feet over the remaining 30 feet. The extension is of round timber, full ballasted and close-fendered. The work under contract has been prosecuted vigorously since the spring, and is approaching completion.

NEGRO ISLAND.

Negro Island, Shelburne County, is situated at the entrance to Negro Harbour, and is about mid-way between Shelburne Harbour and Cape Sable.

The island, which is higher than the neighbouring coast, is divided into two nearly equal sections, the only connection between them being a narrow neck or spit of sand or gravel, about one-quarter mile long, which is dry at all times of tide.

This neck, besides being the roadway between the two portions of the island, forms a natural breakwater to the small harbour where most of the small fishing boats of the island are kept. The southern side of this neck or spit is at times exposed to a heavy sea, and for some years its crown has been wearing away, until about five years ago the tide began to ebb and flow over it.

Some three years ago the inhabitants becoming alarmed that both the harbour and roadway would be destroyed, obtained assistance from the local authorities and built a piece of beach protection work, 100 feet long over the lowest part of the spit.

The beach on either side of this piece of work being dangerously low, the Department, during the past year, extended the beach protection and repaired the former work.

The new work is 189 feet long and 12 feet wide, and is built of round logs, with cross ties at every 10 feet. It averages 3 feet 9 inches high; has a continuous ballast floor laid on the bottom tier of longitudinals, and is filled to the top with stone ballast. The protection work now extends over the whole length of the low beach, and the spit appears to be fast building up to its original height.

PARTRIDGE ISLAND PIER.

Partridge Island Pier is situated on the north side of the Basin of Minas, about a mile to the westward of the mouth of the Partridge Island River, and about two miles distant from the town of Parrsboro', the terminus of the Cumberland Railway and Coal Company's railway.

The pier being directly on the seashore, has the benefit of the full extent of the tides, and as vessels can approach it and leave it at full tide, it is the principal point of communication between Cumberland County and the counties of King's and Hants, on the south shore of the basin; and the steamers of the Basin of Minas and the St. John and Basin of Minas routes, call there regularly during the season.

It is about 500 feet in length, and its width on top varies from 27 to 29 feet. The inner end, for a distance of 378 feet, is 2 feet above high water springs, thence for a distance of 42 feet it slopes 6 feet, thence to the outer end it keeps its level, which is 4 feet below high water springs. On the inside of the outer end it has a narrow inclined landing to afford passengers and freight a chance to land at all times of tide. It is built of squared timber, with perpendicular faces, and is floored over. At the outer end it is 30 feet high, and the beach drives out, at low water, about 100 feet from the end of the pier.

The pier was built during 1864-65 by the Local Government of Nova Scotia, and since Confederation it has been extensively repaired by the Department. It is exposed to south-easterly gales, and when the ice is running up and down the bay with the wind and tide, and the top being low, and the outer portion submerged during high water springs, it is in constant danger of being damaged.

During a heavy south-easterly gale, on the 1st October, 1889, the top of the outer end of the pier, for a distance of 30 feet and 4 feet in depth, was wrecked, the face timbers having been knocked out of their places, the ballast washed out, and a portion of the flooring removed.

Last spring a small amount was expended in placing and securing some long piles on the inner face of the outer end, to fender off the steamers, which during high water spring tides, were in danger of going on to the wrecked portion of the pier.

Spring tides rise 41 feet; neap tides rise 34 feet.

PARTRIDGE ISLAND RIVER.

This river enters the north side of the Basin of Minas, the south-eastern arm of the Bay of Fundy, at the Village of Parrsboro', Cumberland County, the terminus of the Cumberland Railway and Coal Company's railway (formerly the Springhill and Parrsboro' Railway). The river from the village to its mouth forms the harbour, and it is a very important shipping point for coal and for lumber.

The channel of the river is very crooked, and in the spring of 1879 the work of cutting off Robertson's, Shannon's and Mullin's Points was commenced by the Department, and continued from year to year until 1884, when the contemplated work was brought to completion.

The "spit" making out from the end of the sand bar on the eastern side of, and near the mouth of the river, and consisting of clay and gravel, has always been a serious obstruction to navigation, necessitating a very sharp turn at this point, particularly when large steamers and vessels come to and leave the new landing pier of the Cumberland Railway and Coal Company's railway, coal laden, and during 1888-89 a commencement was made by the Department for the removal of the outer end of the "spit."

During the last season the work was continued, and 3,800 cubic yards (scow measurement) of gravel and clay were removed by hand on to dump scows, by which the material was removed to the place of deposit.

The point of the spit has now been cut away, for a distance of 285 feet, an average width of 225 feet, and to an average depth of $3\frac{1}{2}$ feet. Over this distance there is at present a depth of 25 feet during high water springs, which is the same depth as at the loading pier.

The river runs dry at low water, excepting a small fresh water channel. Spring tides rise 41 feet; neaps rise 34 feet.

PORT GEORGE.

Port George, Annapolis County, is 37 miles east of Digby Gut on the south shore of the Bay of Fundy.

The harbour, which is dry at low water, is formed by a western breakwater and an eastern pier, both of which structures were built by the inhabitants and the local authorities.

In 1875 the Department expended the sum of \$7,000 in repairing and refacing the western breakwater, which had become much decayed and worm-eaten.

In the autumn of 1888 the outer end of the breakwater was destroyed by a severe storm, 165 feet in length being wrecked and totally destroyed and an additional 25 feet badly damaged. Before repairs could be made a second storm destroyed the damaged portion, leaving 190 feet of the work a complete wreck and rendering the harbour practically useless.

During the Session of 1888-89 an appropriation of \$5,000 was made for rebuilding the breakwater, and during the present fiscal year a contract was entered into for carrying out this work.

Owing to difficulty in obtaining timber, and other delays, active operations were not begun until late this spring, since which time the work has progressed rapidly.

PORT GREVILLE.

Port Greville, Cumberland County, is situated on Greville Bay, on the north side of the Minas Channel, Bay of Fundy, and at the mouth of the Ratchford River. It is about 14 miles west from the town of Parrsboro', and 15 miles east of Cape d'Or.

The harbour is formed by a high gravel and shingle beach which lies parallel to the shore, and as the crown of the beach was washing away, during 1874 the Department constructed a timber protection wall, 2,200 feet in length thereon.

During 1886-87 a breakwater was constructed off the eastern end of the cribwork wall, at the mouth of the harbour, for the double purpose of arresting the gravel and to deviate the course of the river at its mouth so as to shorten its passage to the sea.

During the past year the sum of \$2,500 was expended in re-constructing the top of the cribwork wall for a distance of 2,040 feet, to a depth of 5 feet, to replace the old top which, through the natural decay of the wood, had become so weak that fears were entertained of the sea breaking through it. A cribwork wall, 120 feet in length, was also constructed along the bank on the northern side of the mouth of the harbour to prevent the sea from cutting into the gravel bank.

PORT HOOD.

Port Hood, the shire town of the County of Inverness, is on the west coast of Cape Breton Island, twenty miles north of the northern entrance to the Strait of Canso.

The harbour was formerly a secure one; Smith's Island, which is two miles in length, and forms its northern side, having been connected with the mainland by a range of high sand hills. In 1839 the sea made a breach in this protection; the opening, at first narrow, was enlarged by the tidal currents with increasing rapidity until it was swept entirely away and its site covered by 15 feet of water. The harbour is now unsafe during north-easterly gales, except in a small bay on the east side of Smith's Island.

A pier 550 feet long and 24 feet wide, with an L 100 feet by 25 feet, was built on the eastern shore of the harbour in 1865-66 by the Provincial Government. When first taken in charge of by the Department it was in need of repair. In November, 1871, a portion 200 feet in length, was destroyed. During the two following seasons this was rebuilt, other necessary repairs made and a new block, 125 feet by 25 feet, built at the outer end. Slight repairs were made in 1877-78 and 1879, and extensive repairs in 1879-80, to make good damage caused by gales in October, 1879, in August, 1880, and again in November, 1881. Repairs of a permanent character were made in 1883-84, including a protection work of large stones on both sides of the pier, sloping from high-water on the north side 3 to 1, and on the south side 2 to 1. In 1884-85 some of the large stones of the protection work, which had been disturbed, were replaced. A small amount was expended in repairs to the outer end in 1887-88. While these were in progress the south end of the L was damaged below low water, and subsequently 40 feet of it was carried away. In 1888-89 a block 48 feet by 22 feet was placed at the south end of the L and connected with new work over the damaged portion referred to, the outer or channel face of the L was close-piled over a distance of 70 feet from the south end, and some necessary repairs to the covering and north face near the outer end were made.

In 1880 the depth at extreme low water at the outer end of the pier varied from 17 feet 9 inches, at the north corner, to 14 feet 3 inches at the south corner. Soundings taken in April, 1888, showed a depth of 14 feet 3 inches at the north corner, and from 9 feet 6 inches in to 5 feet between it and the south corner, over a deposit of ballast, and at a distance of 10 feet out, from 12 feet 6 inches to 6 feet over sand. On the completion of the repairs made in 1888-89 the depth at extreme low water at the south or end face of the L was about 9 feet over shifting sand.

The amount appropriated for the year 1889-90 was expended in constructing and close-piling a block 71 feet in length and 24 feet in width against the outer face of the pier between the north corner and the close-piling of the previous year, and connecting it with new top work back of it; in renewing the close-piling over a distance of 34 feet on the north side of the pier near the outer end, and in repairs to the covering of the pier and to the rip-rap of the stone slope on its north side.

After the completion of the above repairs, considerable damage was caused during a succession of northerly gales in December. A settlement of about 3 feet

occurred along the outer face of the 51 feet block, the lower portion parting from the upper work below low water, and permitting the ballast to go out of the face chamber down to about 3 feet below extreme low water. Repairs can be effected by cutting down the outer face and rebuilding.

Sand has accumulated at the south end of the L where the depth at extreme low water, originally 9 feet, has decreased to about 7 feet. Spring tides rise 4 feet.

PORTER'S LAKE.

Porter's Lake, Halifax County, is an extensive sheet of water, about 14 miles to the eastward of the city of Halifax. It is about 18 miles in length, with an average width of about half a mile, and a depth of from 9 to 30 feet over the greater portion of its area. It drains a large extent of country, and receives the waters of several streams.

Its southern end is separated from the Atlantic by several islands, connected by sand and shingle beaches, and from Three Fathom Harbour by a narrow but high and rocky ridge of land. The only outlet was a shallow and circuitous chanuel, about one mile to the westward of the entrance into Three Fathom Harbour, and from its exposed position no dependence could be placed upon it, even for the smallest craft, as storms along the coast would continually change its depth and outline.

During the years 1881 and 1884 the Department closed the old outlet and opened a new one a little to the westward of it. The amount expended was very small, as the business of the locality did not warrant a heavy expenditure, but for a few years the new outlet was kept open, enabling small boats and rafts of timber to pass through it during high water.

Generally, during the spring and fall, the freshets created a strong outward current, and swept away the gravel and shingle which would be thrown into the mouth of the outlet by heavy seas, but during the year 1889 the season was very dry, and the small amount of water discharged out of the lake was not sufficiently strong to clear the gravel and shingle out of the outlet, and by degrees they piled up to such an extent as to completely block it.

The closing up of the outlet caused the water in the lake to rise some 18 inches above the ordinary summer level, and as it was feared that the fall rains would still increase that level, in which case the low-lying lands and the roads and bridges, around the lake, would likely be flooded, during the past year the Department expended the sum of \$200 in re-opening the outlet.

The channel opened is 400 feet in length, 30 feet wide in the bottom, and the average depth of the gravel and shingle removed is 2 feet.

PORT MAITLAND.

Port Maitland, formerly Green Cove, Yarmouth County, is situated about 13 miles to the north of the town of Yarmouth.

The harbour, which is dry at low water, is an artificial one, and is formed by a western breakwater and an eastern pier. It is an important fishing station, and besides the number of boats and small vessels which are employed a considerable amount of capital is invested in the fitting out and management of "traps" or deep water wiers.

In 1878 the Department extended the pier 50 feet, and raised and widened its inner end for a distance of 158 feet, and also built a spur 75 feet long on the breakwater. In 1885 the outer end of the pier was raised and the sheathing of the outer face of the breakwater was repaired and partly renewed by the breakwater.

In the winter of 1887-88 the breakwater was seriously damaged by a succession of storms and a breach 86 feet in length was made directly through the middle of the structure, and \$500 was expended by the Department in clearing away the wreckage and securing the work from further damage.

An appropriation of \$4,200 was made during the fiscal year for re-building the breach and repairing the existing parts of the structure, and towards the end of the year a contract was entered into for carrying out this work.

PORT MEDWAY.

Port Medway, Queen's County, is about 10 miles east of Liverpool; it stands on the southern side of a bay of the same name and is 3 miles from its mouth.

The beach-protection works which were built in 1875-76, to prevent the sea from breaking into the harbour were repaired during the present fiscal year.

The repairs extend over about 150 feet of the work, and consist of reballasting the cribs, planking portions of the top to prevent further displacement of the ballast, securing new fenders to the outside face and in some minor repairs.

The work is now in fair order throughout.

ROUND BAY.

Round Bay, Shelburne County, is 3 miles east of Negro Harbour and 13 miles to the southward of the town of Shelburne.

The shores and beaches of this bay are flat and composed of fine white sand, which when dry is liable to drift with winds off the Atlantic. The drifting takes place mostly near high water mark and by lowering the height of the beach enables the tide to flow further and further inland and thus destroys the seawalls and the highway which follows the line of the coast round the head of the bay.

The beaches have for years been protected and the seawalls built up by placing brush and small trees a short distance above high water mark to catch the drifting sand.

The brush, &c., decays and breaks away after a course of time and during the fiscal year 1888-89, the sum of \$100 was expended by the Department in repairing the gaps in the walls with new brush, and also in protecting the mouth of the creek which enters the head of the bay, with heavier material.

The sum appropriated being insufficient to complete the repairs an additional amount of \$80 was expended during the present year to complete the repairs undertaken the previous season.

SHEET HARBOUR.

Sheet Harbour is situated on the Atlantic coast of Nova Scotia, in the eastern part of Halifax County, and is distant about 60 miles to the eastward of the mouth of Halifax Harbour.

This harbour is one of the finest in Nova Scotia, being of considerable extent and having an abundant depth of water. It runs inland some $6\frac{1}{2}$ miles to Jared's Point, where it divides into two arms, called respectively the West and East Rivers.

There are saw and pulp mills at the head of each arm, at which a very large amount of timber is cut, and a considerable amount of pulp is made. The lumber is exported in large vessels, principally barques, to the United Kingdom, and the pulp is shipped in schooners to the United States. Vessels coming to Sheet Harbour, generally arrive in ballast, and as all the available ballast grounds have been filled in, and the further depositing of it would injure the deep water channels, which are already narrow, during the year 1887-88, a ballast wharf was constructed by the Department at the head of the West River.

On the 9th January, 1889, a contract was entered into for the construction of a ballast wharf on the eastern side of the East River, starting from the end of the remains of Hall's wharf, running southerly a distance of 180 feet, and 20 feet wide, with an L 20 feet long and 20 feet wide at the southern end, the work being built of round timber and the top, which is 3 feet above high water springs, is covered with 3-inch plank.

The work was completed during last November, and has proved of great benefit not only as a ballast wharf, but also as a public wharf.

At 10 feet from the face of the wharf, there are from 14 to 16 feet of water at low water springs, which depth will accommodate the largest vessels that frequent the harbour.

Spring tides rise 6 feet 6 inches; neaps rise 4 feet 6 inches.

SUMMERVILLE.

Summerville, Hants County, is situated on the eastern side of the Avon River, about midway between the town of Windsor, the shiretown of the county, and the mouth of the river, where it empties into the Basin of Minas.

The wharf was constructed many years ago by the inhabitants, aided by the Local Government, and, with the exception of some trifling repairs, no work had been placed upon it since its completion. From want of repairs, the structure remained useless for years, and as funds could not be obtained to repair it, Messrs. Churchill of Hantsport, who intended to place a ferry steamer on the route between Summerville, Hantsport and Windsor, during 1887, repaired the damaged end of the wharf, extended it a distance of 36 feet and levelled off the rocky reef outside, to permit their steamers to approach and leave the end of the wharf at two-thirds flood.

The total length of the wharf is about 300 feet, varying in width from 25 to 31 feet, and in height from 4 to 23 feet, the latter being the height at the outer end.

During the past season the sum of \$2,362.83 was expended in the removal of the top of the wharf, to a depth of 3 feet, and in rebuilding it to an average depth of 5 feet, with squared timber-faces, new ballast flooring and ballast.

As the repairs were only started during the month of April ult., the whole of the contemplated work could not be accomplished by the end of the fiscal year; and what still remains to be done is the placing of flooring, capping and fendering.

THREE FATHOM HARBOUR.

Three Fathom Harbour, Halifax County, is situated on the Atlantic coast of Nova Scotia, about 15 miles to the eastward of Halifax Harbour. It is formed by islands and connecting gravel beaches, and although small, is well sheltered from all quarters, and the small vessels which frequent the coast, can enter and leave it at all times of tide. It is the rendezvous of a large number of fishermen, principally inhabitants of the surrounding country, and during the fishing season is a busy place.

For the purpose of preventing the sea from breaking through the narrow gravel and shingle beach which separates the harbour from the Atlantic, the Department during 1878 constructed cribwork along the crown of the beach, and the work was extended since that date.

As the sea breaks very heavily over the beach, at the northern end of the work, with a tendency to scour, during last autumn the sum of \$250 was expended in extending the work, northerly, for a distance of 41 feet, the inner end sloping down to the level of the beach. Some slight repairs to the main structure, consisting of replacing washed-out ballast and broken off fenders, were also effected.

The total length of the work is now 1,050 feet, and it is constructed of round timber, fendered every 5 feet along the seaward face, and thoroughly ballasted.

TIDNISH RIVER.

The Tidnish River, enters Bay Verte on its southern side and near its head it is the largest stream entering the Bay, and for a short distance from its mouth, it forms the boundary line between the Counties of Westmoreland, in New Brunswick, and Cumberland, in Nova Scotia; the western shore being in the former and the eastern in the latter province.

Tidnish Head, about $1\frac{1}{2}$ miles to the eastward of the mouth of the river, is the eastern terminus of the Chignecto Marine Railway, now under construction.

At the end of the fiscal year a contract was entered into for the construction of a public wharf on the south-eastern side of, and near the mouth of the river, Cumberland County.

The wharf is to be 220 feet in length on its centre line, and 20 feet wide, with an L on the upper side of the outer end, 20 feet in length and 20 feet wide, and a shore approach, 20 feet long and 12 feet wide; all of these dimensions being on top, from outside to outside of cap timbers. All faces are to be built with a batter of 1 in 12, and the work throughout, with the exception of cap-timbers, floor-stringers, fenders and fender piles, is to be constructed of round timber. All faces are to be protected by fenders and fender piles, and the top is to be covered with 3-in. plank.

At the end of the wharf, there will be a depth of 9 feet of water at high water springs, which will accommodate the small vessels which trade in the locality.

TWO RIVERS.

Two Rivers, Cumberland County, is situated on the southern side of the Chignecto Channel, about 3 miles to the southward of the Joggins Coal Mines. It derives its name from the fact that two rivers empty here into the sea, at nearly the same point.

Big River, the larger one of the two, is the only important one, as it affords better facilities for shipping and better shelter during storms. An extensive saw mill is situated at the head of the tide, and many vessels come into the river yearly for lumber and piling.

During the year a small sum has been expended in the removal of some large freestone boulders, which, lying on the mud flats on the banks of the navigable channel, near the mouth of the river, interfered with the navigation at high water, and with the proper grounding of vessels during low water.

WALLACE.

Wallace Harbour, Cumberland County, is situated on the south of the Straits of Northumberland, about midway between Pictou Harbour and Bay Verte. It is at the mouth of the Wallace River and is well sheltered from all winds.

Opposite the village of Wallace, which is situated on the south side of the river, a landing was constructed many years ago to accommodate the ferry service across the river, but as the accommodation was only available at, or near, high water, the Department, during 1879, dredged a channel through the mud flats from the main channel of the river to the landing, a distance of about 1,600 feet, with a width of 45 feet and a depth of 7 feet at low water springs, which rise here 7 feet.

The dredged channel is almost at right angles to the shore line, and at high water the tide and sea sweep across it, and considerable silting up took place, particularly at the inner end of the cut, and in 1887 it was cleaned out.

Towards preventing the inner end of the cut from silting up, and to afford at the same time shipping facilities to the inhabitants of North Wallace and Fox Harbour, during 1888-89, the Department commenced the construction of a wharf, starting from the end of the public road, running past the remains of the old ferry landing on to the eastern or seaward side of the cut, the length constructed being 165 feet.

During the last season the sum of \$2,578.41 was expended in extending the wharf a distance of 180 feet, along the seaward side of the cut, 20 feet in width, with an L on the eastern side of the outer end, 20 feet long by 20 feet wide. The work throughout, excepting the fenders, cap-timbers and floor-stringers, was constructed of round timber. All faces are protected by fenders; a ballast floor has been placed over its whole length, and thereon ballast to a depth of 5 feet has been laid. The top was covered with 3-inch plank, and 6 mooring posts were placed.

The total length of the wharf is now 345 feet, of which the outer 180 feet, being along the edge of the dredged channel, can be used for shipping purposes.

WESTERN HEAD.

Western Head is one of the most important shore-fishing stations in Queen's County. It is situated on the southern side of Liverpool Bay, about four miles to the south of the town of Liverpool.

There is a broken rocky ledge projecting from the "Head," which forms a partial shelter and enables fishermen to land in their boats in moderate weather, but the difficulty hitherto has been that the fishermen are not only unable to launch their boats in rough weather, but there is much danger in effecting a landing when they have been caught on the fishing grounds in sudden storms.

In 1887 the Department began the construction of a stone breakwater to give the desired protection, and work was proceeded with during the fiscal year 1887-88 and continued in the year following. The breakwater was built immediately behind and partly in shelter of the rocky ledge, and was constructed entirely of large stone quarried for the purpose, the portion of the breakwater from low water mark upwards being built of selected stone, hand placed and firmly bolted together. The whole work was 40 feet wide on top and 190 feet long.

Soon after the breakwater was completed the coast was visited by an unusually heavy gale which lasted three days and destroyed 100 feet of the outer end of the work.

During the present fiscal year, the sum of \$5,000 was expended in repairing and rebuilding the work. Owing to the depth of water inside the reef, and the difficulty in securing a foundation, it was decided to rebuild on the top of the reef, all of which could be reached at low water. The projecting points of the reef were cut away and a bed prepared for the foundation course which was bolted down to the bed rock and the interstices between the stones filled in with Portland cement concrete; each succeeding course was laid in a similar manner, the top of the breakwater being carried up five feet above high water, and the surface finished off smooth. Where the new and old work join, the breakwater is 40 feet wide^d reduced in width to 29 feet where it joins the reef. The total length of work built, during the present year is 106 feet. No further extension is contemplated and the breakwater is now completed.

WEST JORDAN BAY.

Jordan Bay, Shelburne County, is situated midway between Lockeport and Shelburne Harbour. On the west side of the bay, about one mile to the southward of Jordan Point, there is a deep land-locked pond of salt water which, until a few years ago, formed a safe and convenient harbour for fishing boats and schooners. The waters of this pond are separated from those of the outer bay by a high, narrow gravel bar, through which formerly there was a deep channel. This channel had for many years been getting narrower until, about nine years ago, it closed up entirely during a heavy south-easterly storm.

During the Session of 1888-89, an appropriation of \$1,200 was made for the purpose of re-opening the harbour, and during the past fiscal year this has been successfully accomplished.

The bar being composed of shifting gravel, it was not considered advisable to attempt to open the old channel, for unless expensive protection works were built on one, if not both, sides of the cutting, it would in all probability immediately close up again. Advantage was therefore taken of a small "high water passage," which had been deepened in part by the inhabitants, and this was deepened, straightened, and otherwise improved.

A cutting, 170 feet long, 35 feet wide on the bottom and about 52 feet on top, with an average depth of 3 feet 8 inches, was made, and now fishing boats can pass through at all times of tide, and schooners as large as 40 tons can enter at high water. Spring tides rise at this place 6 feet 9 inches, and neaps 12 inches less.

To guard against any future obstructions by gravel the balance of the appropriation was expended in constructing a pier on the back of the island. This pier is constructed of round timber and is 144 feet long, 18 feet wide and 13 feet high at the outer end.

NEW BRUNSWICK.

CAMPBELLTON.

Campbellton, Restigouche County, a thriving town, and important station on the line of the Intercolonial Railway, is situated on the southern side of the Restigouche River about 15 miles above Dalhousie, the shire town, where the river enters the Baie des Chaleurs.

Campbellton is practically at the head of navigation, although the tide flows up the river some 9 miles further, but shoals prevent the passage of vessels of any size.

Except on the "Traverse," about 4 miles below Campbellton (where the depth is only about 12½ feet) a depth of 18 feet at low water spring tides can be carried to Campbellton, which, with the rise of 10½ feet at springs, and 7 feet at neaps, affords a good depth of water for the class of vessels engaged in trading with the place, these being generally barques of from 400 to 900 tons. The greater number of these arrive in ballast, the disposal of which has been a matter of serious inconvenience, owing to there being no convenient place of deposit, but to remedy this a contract was entered into on the 23rd April, 1889, for the construction of a "ballast wharf," the structure being an isolated block 140 feet in length by 35 feet in width on top, with a depth of 18 feet at extreme low water spring tides.

Work was commenced shortly before the beginning of the year, and at its close was well advanced, being built up to specified height, fendered, &c., and only required some little ballasting, putting on of covering, and construction of ballast traps to complete.

Towards providing a landing and approach for the ferry steamer plying between Campbellton, and Cross Point on the Quebec shore of the river directly opposite, a site was selected and provided by the town council, and a length of 116 feet of the proposed landing has been constructed by the Department by days' labour.

CAPE TORMENTINE.

Cape Tormentine is situated on the New Brunswick coast of Northumberland Strait, and is the nearest point of the mainland to Prince Edward Island, from which it is distant about 9 miles. It is connected with the Intercolonial by a branch line from Sackville, 36 miles in length. When navigation is blocked by ice, the passengers and mails for Prince Edward Island are brought by this line to Cape Tormentine, and taken across by boats to Cape Traverse.

The work under contract is an artificial harbour, formed by a pier extending 2,500 feet in a straight line from high water mark, and having a head and a return each 400 feet long.

For 1,300 feet from the shore the straight pier consists of stone embankment, 20 feet wide on top with slopes of 2 to 1, covered with stones 20 cubic feet and upwards in size, laid close. The remaining 1,200 feet of the straight pier is to be of cribwork 30 feet wide.

The head and return of similar cribwork are to be 40 feet wide from the base to 1 foot above low water, and 30 feet wide on top, the slope to be sheathed with hardwood plank.

The work is 4 feet above high water, and reaches a depth of 15 feet at low water spring tides.

During the year 1st July, 1889, to 30th June, 1890, the stone embankment has been extended a distance of 571 feet, attaining its full length on top, viz.: 1,300 feet; and 400 feet of cribwork substructure has been sunk in place and part of the superstructure of No. 1 crib has also been built.

DALHOUSIE.

Dalhousie, Restigouche County, is situated on the right bank of the River Restigouche at its entrance into the Baie des Chaleurs.

Dredging was done at the public wharf and a passage opened to the main channel.

EDGETT'S LANDING.

Edgett's Landing, Albert County, is situated on the west side of the Petitcodiac River, about 10 miles above its mouth, and 2 miles south of the village of Hillsboro', a railway and telegraph station as well as the business centre of the county.

The port or shipping district of Hillsboro' extends from Edgett's Landing for 4 miles up the river, to what is known as Gray's Island, and contains in it "Edgett's," "The Albert Manufacturing Co." and "Gray's Island" wharves, all private, and about its centre the Breakwater or Lighthouse Pier, built by the Department in 1874.

Annually about some 30,000 tons of shipping loads in the district, consisting principally of schooners of from 100 to 300 tons, the greater number of which arrive in ballast, to facilitate the discharge of which a contract was entered into 15th January, 1889, for the construction of a ballast wharf at Edgett's Landing on the site, where many years ago, and before the existence of the Albert Railway, the Government of New Brunswick had constructed what was then known as the "steamboat wharf," but which was destroyed in the fall of 1869 during the "Saxby Gale."

The proposed ballast wharf is to be 400 feet in length, reaching to within 150 feet of low water mark, and will have at its outer end 30 feet of water at high water spring tides (which here rise 45 feet, neap tides 38 feet), the width at the outer end being 40 feet reduced at each 100 feet inward 10 feet.

Most of the materials required were got out by the contractors during the winter of 1889, and work commenced in the beginning of June was abandoned at the end of the same month.

In September, 1889, the contract was cancelled by Order in Council, and materials that had been supplied taken charge of by the Department, construction of the work being resumed under direct charge on the 20th May, 1890, and up to the end of the fiscal year the progress made has been most satisfactory; on the outer 100 feet or 40 feet wide portion which is built closed-faced of square timber, a height of 17 feet has been built, a considerable length of the next section, 30 feet wide, also being well advanced, the latter being constructed of round logs, open crib-work.

FORT DUFFERIN.

Fort Dufferin, at the western entrance to St. John Harbour, is situated on Negro Point, at the inner end of the breakwater.

During the fiscal year an addition of 100 feet in length has been made to the retaining wall that extends northwardly from the inner end of the breakwater round the foot of the hill on which the fort stands.

GRAND ANSE.

Grand Anse, Gloucester County, on the southern shore of the Baie des Chaleurs, is a small cove about midway between the harbours of Bathurst and Shippegan; it is the centre of a thriving settlement, being also a railway and telegraph station on the line of the Caraquet Railway, by which it is distant 30 miles from Bathurst, and 40 miles from Shippegan. At Gloucester Junction, 3 miles south of Bathurst, connection is made with the Intercolonial Railway system.

The place being in the vicinity of excellent fishing grounds, this industry has been largely followed by many of the inhabitants of the district as a means of livelihood, some 90 boats being in all engaged at net, line and lobster fishing.

The Department in 1875, to afford protection for the fishermen, began the construction of a breakwater, which was carried to completion in 1879. It was built a distance of about 600 feet from the shore, with which its main portion (225 feet in length) was parallel, a return or L 50 feet in length being placed at its western end; by this work a considerable area, carrying from 6 to 7 feet of water

at low tide was well sheltered, and the protection and accommodation desired obtained.

Owing to its exposed situation, almost yearly expenditures were found necessary for repairs, the most serious damage occurring in the spring of 1886, when the entire top and down to within about 2 feet of low water was carried away by the pressure of the ice during a northerly storm and high tide, the wreckage being deposited in part of what had formed the boat harbour. The ice on this occasion piled up along the shore from 20 to 30 feet high; the storm was said to have been the most severe known.

With the amounts appropriated during 1886-87-88-89, the entire work has been reconstructed, its width being increased 10 feet on the seaward or exposed side, which above low water has been formed with a slope of 1 to 1, and covered with sheathing 5 inches in thickness. A length of 10 feet was also added to its eastern end, and a considerable amount of wreckage removed from where it was obstructing the sheltered area.

During the past fiscal year, 1889-90, the L or return at the western end of the breakwater, has been extended 100 feet shorewards, and a further amount of ballast, &c., removed.

The length of work built is of close-faced timber, double fendered, fully ballasted and floored over, and having a timber-break $3\frac{1}{2}$ feet high secured by knees, &c., at 10 feet centres on its seaward or outer side; it is 21 feet wide on top, averages 15 feet high, battering on the sides and outer end 1 in 18.

Spring tides rise $6\frac{1}{2}$ feet, neaps 4 feet.

GRAND LAKE.

During the year a cut 1,600 feet in length, 50 feet in width and to a depth of 14 feet was made through the flats in the Grand Lake.

LINCOLN.

Lincoln is a parish, and settlement of Sunbury County, fronting on the south side of the St. John River.

It is a rich agricultural district, thickly settled, from which, annually, quite a quantity of cattle, hay, and general farm produce are shipped.

The post office "Lincoln" is situated at about 2 miles from the eastern boundary of the parish and near the site of the public wharf built many years ago by the Government of New Brunswick; its distance from "Wassis," a station on the Fredericton Branch of the New Brunswick Railway, being five miles, or from Fredericton by post road or river, about 9 miles.

For many years the wharf has been quite unserviceable, but to render it available for public use, during the past fiscal year, it has been completely repaired and enlarged; being raised 5 feet over all of its frontage, 60 feet on the river; this width of wharf extends back 50 feet, after which an approach 22 feet wide and 50 feet in length connects it with the shore. The outer portions are planked over, while the roadway of the approach is stone gravelled over.

Along the face of the wharf the depth of water obtainable (low water summer level) is 9 feet, and its height above this of 8 feet makes it available generally except during the short duration of the extreme height of a high spring freshet.

Its upper side is protected against the running ice by a sloping face of 1 to 1, sheathed with tamarac spars, and to accommodate vessels at low water a slip has been provided.

MISPEC.

Mispec Harbour is situated on the north coast of the Bay of Fundy, at the mouth of the Mispec stream (formerly known as Bail's Creek) about 10 miles to the eastward of the city of St. John.

The harbour is exposed to south-westerly gales, to protect it from which, some fifty years ago, Mr. Ball, the then owner of extensive saw-mills on the stream and

other property in the vicinity, built a breakwater from the western shore, and so afforded shelter for vessels visiting the place to load. During the "Saxby Gale" of 1869 the breakwater was badly damaged, and shortly afterwards rendered useless by other storms.

The Department in 1884 undertook and completed the construction of a new work selecting a site about 700 feet south of the old one, by which change the area of the shelter was increased and a gain of fully 2 feet obtained in the depth of water.

The breakwater is 200 feet long, 20 feet wide on top, 30 feet high at the outer end and sloping in part 1 to 1 on the seaward side; it is built close faced of square timber and filled solidly with rock ballast, and affords good shelter for small coasting vessels and fishing boats.

During the past fiscal year the seaward face of the work on a length of about 60 feet has been repaired.

MIZZONETTE.

Mizzonette Point, Gloucester County, is the extreme eastern end of the small peninsula that separates the upper part of Caraquet Harbour from the Baie des Chaleurs.

It is distant from Grand Anse 9 miles east, and about 3 miles by water from the village of Caraquet, both of which are stations on the line of the Caraquet Railway. The peninsula or district is some 3 miles in length, and has settlers along both sides of its coast, numbering in all, it is said 100 families, the principal portion of these living near the "Point," where the post office and public school are situated.

To accommodate the residents of the district a contract was entered into 19th February, 1889, for the construction of a landing wharf, which was satisfactorily completed on the 19th September of the same year. This wharf has a length of 500 feet, 480 feet of which is 12 feet wide; the remaining 20 feet (or outer block) having a width of 20 feet; it is formed of alternate "blocks" and "spans," floor stringered and planked over, the "spans" having corbels extending outwards from the "blocks" 5 feet beneath the floor stringers. The sides of the roadway are protected by cap-timbers and "blocks" double fendered. The outer block while nearly dry at extreme low water spring tides, usually at low water carries better than 2 feet. Spring tides rise 6 feet; neaps 4 feet.

OROMCTO SHOALS.

The Oromocto Shoals of the St. John River lie between Thatch and Oromocto Islands, about 10 miles below Fredericton.

These shoals extend from Belmont Wharf to the mouth of the River Oromocto, opposite the foot of Thatch Island, and the channel, 1,000 feet in length, 50 feet in width and 14 feet in depth, was dredged by the "New Dominion" through them during the year.

QUACO.

Quaco Harbour situated on the north coast of the Bay of Fundy, about 30 miles east from St. John, is at the mouth of a small river, being a basin of about 15 acres area, well protected by high rocky cliffs on all sides, excepting from the south-east, the entrance being exposed between east-south-east and south-south-west.

In 1873 the Department constructed a breakwater 300 feet long on the eastern side of the entrance, and in 1882-83 one of the same length on the western side, these works rendering the harbour a safe place of refuge for coasting vessels, accessible, however, only between about four hours flood and two hours ebb tide, as at low water it entirely dries, excepting the fresh water channel of the river. Spring tides rise 30 feet, neaps 25, and give within the harbour at high water from 15 to 20 feet.

During a storm that occurred on the 5th December, 1889, the seaward face of the western breakwater was damaged, the sheathing and longitudinal timbers of the sloping face being carried away for a distance of about 60 feet, and a quantity of ballast washed out of the work, as well as other damage being done.

Repairs were effected during January and February of the present year, but part of the face is still in an insecure condition should a severe storm occur during the time of high water spring tides.

RICHIBUCTO.

Richibucto Harbour, Kent County, is situated on the south-west shore of the Gulf of St. Lawrence, about 40 miles north from Shediac Harbour (Point du Chêne) the eastern terminus of the Intercolonial Railway.

The entrance which lies between sand beaches is obstructed by a shifting sand bar, and the Department, in 1873, began the construction of a breakwater towards its improvement, extending in a south-easterly direction from the point of the "North Beach," it being proposed that one also should be built in a north-easterly direction from the "South Beach," the object being to confine the outflowing waters to one permanent channel, and so carry them through the bar, which it was supposed the increased current might remove by scouring. Work on the northern breakwater was continued up to 1875 when it had been extended 1,200 feet; it was then found that the sea during easterly storms set very heavily against its south face, and running along it undermined its inner end and carried away portions of the sand beach to such an extent that there was great danger of a channel being formed through it at the inner end of the breakwater, rendering the constructing of protective works necessary to prevent this encroachment of the sea.

With the amount appropriated for the past fiscal year, 94 feet has been added to the inner end of the "beach protection" connecting it with the sand hills where, from the trend of the shore line, it is hoped further extension may be unnecessary; several spaces from where the stone ballast had been removed from the work built in former years have also been refilled.

Removing ballast from the work as is the constant practice of the lobster fishermen and others fishing off the harbour has been a serious injury to the work and loss to the Department. Stone is taken for trap moorings and net weights and for ballasting the fishing boats when going out light to fish, the quantity removed for the latter purpose being each year very large, and no doubt has been one cause for the constant repair required.

Dredging was done during the past year in the north and south channels of this harbour.

RIVER RESTIGOUCHE.

The channel through the "Traverse," in the River Restigouche, was improved during the past year by one of the Departmental dredges, a large amount of sand, mud, &c., being removed.

ST. JOHN RIVER.

The St. John is the largest river in the Maritime Provinces, having a length of about 500 miles; it takes its rise in the State of Maine, near the source of the Penobscot and Connecticut Rivers, and falls into the Bay of Fundy at the Harbour and City of Saint John.

Its length in New Brunswick may be divided into three sections—the first 75 miles in length, between the mouth of the St. Francis (where the river first touches Canadian territory) and the Grand Falls, to within two miles of which latter point it forms the boundary line between Maine and New Brunswick. The second, 140 miles in length, between Grand Falls and Fredericton; and the third, 80 miles in length, between Fredericton and St. John.

The first section is navigated now only by tow boats, though at one time, it is said, a small steamer plied on it occasionally.

The second section is navigable by stern-wheel steamers during high water in spring and autumn, and generally by tow boats during open water, the rapidity of the current preventing the employment of sailing vessels beyond "Spring Hill," six miles above Fredericton.

The third section, over all of which the influence of the tide is slightly felt, is navigable for steamers and sailing vessels drawing not more than 10 feet.

During the fiscal year on the first section repairs were made to the tow paths, and a number of boulders and sand bars removed from the channel; at the Grand Falls a further expenditure was made in blasting the dangerous rocky ledges.

On the second section (in Victoria County), between the mouth of the Tobique and Grand Falls, boulders and sand bars were removed from the channel, and the tow path was repaired; similar work being performed on the Tobique River itself, where in addition a number of rocky ledges were removed by blasting. In York County, at "Bear Island Bar," 25 miles above Fredericton, improvement of the middle channel was made, the southerly one formerly used being rendered useless from the accumulations of sunken trees, gravel, boulders, &c., carried into it by the freshets of late years.

On the third section, between Fredericton and St. John 118 "snags" have been removed from the steamboat channel, hauled on shore above high water and cut up into short lengths.

ST. LOUIS.

St. Louis, Kent County, is a closely built and rapidly growing village (exclusively settled by Acadian French) situated on the south bank of the Kouchibouguacis River, about 4 miles from its mouth where it enters the Gulf of St. Lawrence, and 7 miles northward from Richibucto, the shire town of the county; it is the terminus of the "Kent Northern Railway."

The Kouchibouguacis at St. Louis has a width of about 700 feet and is spanned by the highway bridge, a swing span in this admitting of the passage of vessels further up the stream which is navigable for some miles.

To provide wharfage accommodation a contract was entered into 6th November, 1888, for the construction of a wharf 200 feet in length and 30 feet wide on top, to extend in a north-easterly direction from the outer end of the south abutment of the bridge, and was satisfactorily completed on the 21st September, 1889.

The wharf is built of round logs, open cribwork fendered on face at 10 feet centres, and after being well filled with ballast, floor stringered and planked over and has along its face a depth of 7 feet of water at low water spring tides, which here rise $3\frac{1}{2}$ feet; neaps, 2 feet.

SHIPPEGAN.

Shippegan Harbour, Gloucester County, formed by Pokesudie Island, and mainland on the west and Shippegan Island on the east, is situated near the entrance to the Baie des Chaleurs (of which it is an arm) about 60 miles east of Bathurst, the shire town of the county, with which it has communication by the line of the Caraqueet Railway.

At the southern end of the harbour connection is made with the Gulf of St. Lawrence by "Shippegan Gully," a shoal and difficult channel formerly used only during fine weather by the smaller fishing boats and vessels of light draft.

By the use of the "Gully" a saving in distance is made of from 25 to 40 miles for the fishermen going or returning to their homes from the fishing grounds, situated off the "Gully." Shippegan Harbour is also a most desirable shelter during storms, while to pass through the "Gully" is the most direct course for the fishing fleet of Caraqueet and the other extensive fishing stations on the south shore of the bay. Before the construction of the Intercolonial Railway it was much desired that the "Gully" should be deepened sufficiently to permit of the passage of steamers bound from ports in the Strait of Northumberland to those on the Baie des Chaleurs.

That the "Gully" might always be available for entrance, as also permit of its use by the larger sized fishing vessels, the Department, in 1875, entered into a contract for the construction of a breakwater 1,750 feet long to protect the entrance, and a dam 870 feet long to close an opening known as the "East Gully." Difficulty was had with the contractors, who suspended operations at the close of the summer of 1876, and the work was re-let in December, 1877, operations being resumed April, 1878; but the second contractors, about the end of July, stated their inability to proceed further with the work, and it was taken over by the Department.

At this time the dam was completed, about 900 feet of the breakwater raised to its proper height, and a further 500 feet in length of it partly built.

In October, 1879, a storm occurred, during which the tide rose 4 feet higher than before known, seriously injuring the dam, while the unfinished outer 500 feet of the breakwater was completely destroyed and the inner portion much damaged. In 1880-81 the dam was repaired, raised and strengthened by piles driven 10 feet apart, connected by caps and walings. During 1883 portions of it that had again settled were raised where deemed unsafe, and an extension of 120 feet added to the remains of the breakwater; a gap that had been made being closed as well, and other portions of the structure raised.

General repairs were again made in 1884-85, when 50 feet of the outer end was close-piled, the "Dam" at the time being raised where settlement had taken place. Further close-piling and some general repairs of the work were also done in 1886-87, while during 1888-89 a length of 60 feet was reconstructed, which had been seriously damaged the previous winter.

During the past season some further close-piling and repairs have been made to the outer end of the work, which is now generally in good condition. On the 26th November a contract was entered into for an additional block at the end of the eastern or present breakwater, and the construction of a breakwater extending 1,100 feet in a southerly direction from the western beach at the entrance of the "Gully." Materials for the works were got out during the past winter, and a large portion delivered at the site by the end of the fiscal year, and 7 feet in height of the "additional block" (40 feet by 50 feet) had been built, placed in position and secured by ballasting.

The works so far built at the "Gully" have given most favourable results, improving the depth of water in the channel fully 2 feet, and already proving of great benefit to the fishing fleet of the harbour and surrounding districts.

UPPER SALMON RIVER.

Upper Salmon River, Albert County, N.B., empties into Salisbury Bay at the head of the Bay of Fundy, about 4 miles north-east of Matthew's Head and 10 miles north-west of Cape Enragé.

At its mouth is situated the thriving village of Alma, the proposed terminus of the Albert Southern Railway, now about approaching completion, by which it will be distant 16 miles from Harvey, the present terminus of the Harvey and Salisbury Railway.

During a severe storm that occurred on the 2nd and 3rd November, 1888, a length of about 50 feet of the sheathing, face timbers, &c., of the sloping face, near the outer end of the work, having been carried away, the damage done was made good by the Department during the latter part of the same month.

During the past fiscal year it being found that scouring was taking place at the outer end of the breakwater owing to the action of the sea and current of the river during freshets undermining and endangering it, this portion was repaired and protected so far as possible with the amount available, timbers being inserted and secured under the work along the face and end, after which a deposit of brush and stone was placed, covering the exposed portion.

QUEBEC.

BAIE ST PAUL.

Baie St. Paul is situated on the north shore of the River St. Lawrence, 60 miles east of Quebec, in the County of Charlevoix.

In 1874-75 an isolated block was built at the entrance of the bay in 12 feet of water, at low water spring tides, 3,000 feet from shore at high tide and 500 feet at low tide. It is 200 feet long, 25 feet wide, with a head at outer end 45 feet by 55 feet long, on which stands the lighthouse.

This block is used by steamers as a landing place, but affords poor accommodation, as passengers and baggage have to be taken to shore in row boats, as well as wait until the tide is either low or high, and it cannot be used for heavy freight or live stock.

During the summer of 1882 a wharf was commenced on the eastern side of the bay at Cap aux Corbeaux. This wharf is now 786 feet long, 30 feet wide, with 8 feet of water at the end at low water spring tides.

On the 19th May last a contract was entered into to extend the wharf 75 feet, which will give a depth of water of 9 feet, barely sufficient for the boats of the Saguenay line to call during heavy winds.

On the 29th October, 1889, the sum of \$1,500 was authorized for repairs to the east side of the isolated block, which had been damaged by ice. The work had to be suspended on the 30th November, owing to cold and stormy weather. The sum of \$1,204 had then been expended.

Spring tides rise 21 feet; neap tides, 13 feet.

BEAUHARNOIS.

The *chef lieu* of the County of Beauharnois is on the southern shore of Lake St. Louis, 20 miles above Montreal.

Dredging was done between Robillard's and Baker's wharves.

BERTHIER (EN BAS).

Berthier, 24½ miles below Quebec, on the south shore of the St. Lawrence, is in the County of Montmagny.

During the last fiscal year the work done consisted in re-planking the footpath on both sides of the wharf, 100 feet of capping have been removed, 4 mooring posts replaced, and a few other small repairs done.

BOUCHERVILLE.

The Village of Boucherville is on the south shore of the River St. Lawrence, opposite Longue Pointe, 8 miles below Montreal.

A channel of 2,300 feet in length, of an average width of 40 feet and, 9 feet deep at low water, was dredged north of Molson's Island.

CAP CHATTE.

Cap Chatte is situated on the St. Lawrence, at the extreme western end of the County of Gaspé.

The improvements to the channel of this river by the removal of rock, referred to in my report of last year, have been completed, and vessels can now enter with safety.

CAP DE LA MAGDELEINE.

Cap de la Magdeleine is in the County of Champlain, and on the north shore of the River St. Lawrence, 3 miles below Three Rivers.

A quantity of stone ballast was placed in the wharf, and the approach raised 15 inches over its whole length, filled with ballast and planked.

CAP SANTÉ.

The parish of Cap Santé is situated in the County of Portneuf, on the northern shore of the St. Lawrence, and is about 30 miles above Quebec.

At neap tides the boats can only approach the wharf when the water has risen to the height of 7 feet 9 inches, and even then with danger, owing to the boulders which obstruct the river, a number of which were removed from the channel leading to the wharf.

CHATEAUGAY.

A departmental dredge opened a channel during the year at the western end of Nun's Island, and in front of the wharf as well as a channel through the shoal at the eastern entrance of the island.

CHENAL DU MOINE.

This channel lies between Ile du Moine and the parish of Ste. Anne de Sorel, on the south side of the St. Lawrence, about 3 miles below Sorel.

Timber, ballast and other materials for the construction of an additional ice pier were procured during the year.

CHICOUTIMI.

Chicoutimi is at the head of navigation on the River Saguenay, 71½ miles above Tadoussac.

The head of the wharf was extended westwardly a distance of 130 feet, and the flooring renewed where required.

COTEAU LANDING.

Coteau Landing is situated on the north side of the River St. Lawrence, at the foot of Lake St. Francis. It is the *chef lieu* of the County of Soulanges, 2 miles from Coteau Station, Grand Trunk Railway, and 36 miles from Montreal. During the season of navigation the Richelieu and Ontario Navigation Company's steamers call at Coteau Landing, besides several local lines of boats. It is the chief grain-shipping port of the county.

There are several wharves at this place, but the wharf known as the Richelieu and Ontario Navigation Company's is the one referred to in this report. It is 904 feet in length, including a block 279 feet by 24 feet at the outer end. The bridge or approach has a general width of 12 feet, with two sidings for the crossing of teams.

In 1889 the rebuilding of the approach, which has a length of 800 feet, was commenced in March and completed in August, 1889.

ETANG DU NORD.

Etang du Nord is at the western end of Grindstone Island, one of the Magdalen Group, Gulf of St. Lawrence.

The breakwater at this place is 500 feet long, 32 feet wide, and from 12 to 28 feet in height, with 21 feet depth of water at the end at low tides.

During the last fiscal year some of the sheathing was renewed, and 133 toises of stone placed in the talus to fill gaps made by the ice.

GATINEAU POINT.

During the summer of 1889 the improvements made at Gatineau Point, which is on the Ottawa River, about 2 miles below Ottawa City, consisted in raising the retaining wall above the wharf 2½ feet, and to the level of the public road. It was found necessary also to fill in with gravel and sand the space between the shore and the wharf, which had subsided to its former level.

GRAND PABOS.

Grand Pabos, Gaspé County, is distant from Percé 30 miles.

In 1886 the Department commenced the improvement of the harbour of Grand Pabos, and during the past year dangerous rocks were removed and cribwork, 215 feet in length, 24 feet in width and of an average height of 10 feet has been built.

HUDSON.

Hudson is on the Ottawa River, in the County of Vaudreuil.

Dredging was done in front of the wharf at this place and a channel opened east and west from the wharf to the main channel to a depth of 7 feet.

ILE AUX COUDRES.

Ile aux Coudres is in the County of Charlevoix, about 62 miles east of Quebec.

The island has a length of about 9 miles, and is 3 miles broad. It lies $1\frac{1}{2}$ miles from the north shore of the St. Lawrence, the upper end being nearly opposite Baie St. Paul.

In 1881 a wharf was built on the north shore of the island, at a distance of 3 miles from its western end. This wharf is 263 feet long and 30 feet wide, with 14 feet of water at its end at low water spring tides. It is in a good state of preservation, though it has settled down about 2 feet at the outer end.

During the year two spans between inner piers were filled with cribwork and stone ballast, and the plank covering was renewed.

Spring tides rise 21 feet; neap tides 13 feet.

ILE PERROT.

Ile Perrot is in the County of Vaudreuil, at the mouth of the River Ottawa, which it divides into two branches. Both the Grand Trunk and Canadian Pacific Railways cross the northern end of the island, but the nearest stations to the island are Vaudreuil and St. Anne de Bellevue. The trade is principally done with the city of Montreal, and consists in general farm produce.

In 1887-88 a wharf was built on the south side of the Island, on Lake St. Louis, $1\frac{1}{2}$ miles below the church.

It consists of a block 120 feet in length by 30 feet in width, with a depth of 8 feet of water, and is 580 feet from shore. It was built by contract.

In 1888 and 1889 the span between the block and shore, a length of 600 feet, was built.

This approach consists of ten cribs, four of which are 12 feet and six 20 feet in width, connected together by means of stringers. The shore abutment has a length of 182 feet. The width of the approach is 16 feet.

A shed, 16 by 20 feet, was also built.

ISLE VERTE.

Isle Verte, on the south shore of the St. Lawrence, is in the County of Temiscouata, 9 miles below River du Loup.

Four hundred and thirty-five feet of wharfing, 20 feet wide, with an average height of $6\frac{1}{2}$ feet, have been constructed. This work is the continuation of the approach to the block built at the mouth of the river.

KAMOURASKA.

Kamouraska is on the south shore of the St. Lawrence, in the County of Kamouraska, 90 miles below Quebec.

The works at this place during the past year consisted in building an extension 110 feet in length, 25 feet wide and 13 feet high to the old wharf.

Repairs to the old wharf have also been commenced.

LACHINE.

One of the Departmental dredges operated in deepening at the inside of the Lachine wharf to enable vessels requiring shelter to give an easy access to the pier. Dredging was also done in the channel north of the boulder shoal at the head of the Lachine Canal.

LAPRAIRIE.

Laprairie is the *chef lieu* of the county of the same name, and is situated on the south shore of the River St. Lawrence, 7 miles above Montreal. It contains churches for the Episcopalians and Roman Catholics, a convent, an orphans' home, a foundry, telegraph office, eight hotels and about twenty stores. The first railway in British North America was constructed from Laprairie to St. John's in 1836. It was first run by horses, then by steam, but was discontinued on the construction of the Champlain road and the rails removed. A steam ferry runs between Laprairie and Montreal, making several trips a day. The population is about 2,500. Laprairie is one of the stations of the Champlain division of the Grand Trunk Railway.

During the winter of 1886-87 two ice piers were built to prevent damage being done to property during the breaking up of the ice in the spring. They have proved thoroughly satisfactory. In 1887-88, to protect the town from disastrous floods, an earth embankment, 1600 feet in length, was constructed at the upper end of the town. During the floods of the two last winters it has proved most successful. Along the shore, east of the ice pier, a cribwork retaining wall was built on a length of 480 feet. This wall is 10 feet in height, and is filled principally with stone.

The retaining wall, 335 feet in length, commenced in 1888, was completed last fall. It has a height of 16 feet and a width of 20 feet.

LES EBOULEMENTS.

Les Eboulements is a village in the County of Charlevoix, on the north shore of the St. Lawrence, 72 miles east of Quebec and 18 miles west of Murray Bay.

A wharf was built here in 1853 about 3 miles west of the village, where the boats of the Saguenay line of the Richelieu and Ontario Company call five times a week during the summer months.

The wharf is 890 feet long, 30 feet wide in the main, with a head 80 feet wide by 42 feet, with shed, store-room and waiting-room. The depth of water at its outer end is 10 feet at low water springtides.

During the year the sheathing of the south-west corner, which had been damaged by ice, was repaired, a hand-rail constructed along the east side of the wharf, the store-room enlarged and new planks placed on the top covering. The wharf is in a good state of repair.

Spring tides rise 21 feet; neap tides 13 feet.

LONGUEUIL.

The town of Longueuil, the *chef lieu* of the County of Chambly, is situated on the south side of the River St. Lawrence, nearly opposite the eastern end of the city of Montreal. The Sorel and Montreal and the South-Eastern Railways have a station at Longueuil. The Richelieu and Ontario Navigation Company own a wharf at the upper end of the town, but its distance from the business or centre portion, besides the increasing trade of the locality, demanded more wharfing accommodation, and in the spring of 1887, at the request of the Town Council, the Department commenced the construction of a pier, and a contract has been entered into with Mr. A. Chagnon for its completion.

When completed the pier will be 1,105 feet in length, including a block at the outer end 40 feet by 80 feet; 90 feet of the pier is 30 feet in width, and the remaining 975 feet 20 feet. Six buttresses on the lower side will also be built. At the block there are 7 feet of water at its lowest stage. The pier is built 9 feet 6 inches above low water line. The work is under progress, and will be completed about the 1st of November next.

MONTEBELLO.

At Montebello a channel 525 feet long, 60 feet wide and 7 feet deep was opened through a clay bar from the Ottawa River to Kiernan's Bay.

MURRAY BAY.

Murray Bay, or Malbaie, is situated on the north shore of the St. Lawrence, in the County of Charlevoix, 90 miles east of Quebec, at the mouth of the River Malbaie. At low tide this bay is left dry on its full extent, with the exception of several small channels which carry the waters of the river.

On the west side of the bay is the projecting rock, called Point au Pic, where the so-named Murray Bay wharf is built.

This wharf was built in 1855; it was lengthened in 1875 a distance of 30 feet, and is now 500 feet long, 30 feet wide in the main, having a head 108 feet wide by 70 feet, with a shed, store-rooms, waiting-room and lighthouse. The depth of water at its end is 12 feet at low water spring tides. Spring tides rise 20 feet; neap tides 12 feet 6 inches.

The sheathing on the south-west corner, which had been damaged by ice, was repaired, as well as the top covering, and the wharf is in a good state of preservation. The planking at the outer end, however, will soon require renewal.

NEWPORT RIVER.

The east retaining wall was extended 90 feet in length by 20 feet in width and 13 feet high, and the old work repaired where required.

NICOLET.

The town of Nicolet, distant 13 miles from Three Rivers and 28 from Sorel, is situated upon the eastern side of the river of that name, which takes its rise in Lake Nicolet in the centre of Wolfe County, and after a course of 80 miles flows through the parishes of L'Esperance, St. Paul of Cnester, St. Christophe, St. Albert, St. Clothilde, St. Monique and St. Jean Baptiste de Nicolet, emptying into the St. Lawrence on its southern side at the foot of Lake St. Peter.

The trade of Nicolet is chiefly in lumber. There are five saw mills on the River, which are kept supplied with timber from the limits above.

An additional length of 686 feet of pile-work was constructed during the year, stone was placed in those parts of the work where settlement had taken place, and a quantity of sand which had washed into the channel was removed by a dredge.

POINTE AUX ANGLAIS.

A channel 7 feet deep was made through the shoal of boulders obstructing the passage of boats from the wharf to deep water in the Ottawa.

POINTE À VALOIS.

Pointe à Valois is situated on the south shore of the Lake of Two Mountains, in the County of Vaudreuil, and is $4\frac{1}{2}$ miles west of the village of Vaudreuil, which is the nearest railway station.

The wharf under construction consists of a block 75 feet by 25 feet, with an approach of 110 feet, 20 feet in width. There is a depth of 6 feet 3 inches of water at its outer end, and the total height of cribwork is 17 feet. It is not completed.

The old pier and the right of way was purchased from Charles Valois for the sum of \$600.

POINTE ST. PIERRE.

Pointe St. Pierre, County of Gaspé, is situated at the western entrance of Gaspé Bay, is 21 miles distant from Gaspé Basin and 15 miles from Percé.

The work of removing a dangerous granite reef in the harbour was commenced during the past year, and the work is now well in hand, some 200 cubic yards having been removed.

RIMOUSKI.

Rimouski is situated on the south shore of the St. Lawrence, in the County of Rimouski, 180 miles below Quebec.

The work here consists in a protection pier 325 feet in length, 18 feet wide at base, on the westerly side of the wharf, at its outer end. This work which is under contract, is in progress.

RIVIÈRE DES PRAIRIES—ILE BIZARD AND STE. GENEVIÈVE.

On the 24th October, 1889, a contract was entered into for the construction of two piers at St. Geneviève and St. Raphael de l'Île Bizard, County Jacques Cartier, Quebec.

The contractors have delivered most of the material required for the construction of the two piers, and work will be commenced in a few days.

RIVIÈRE DU LIÈVRE.

The Rivière du Lièvre flows into the Ottawa 18 miles below the city of Ottawa; its general course is southerly, and its width for 20 miles above the mouth varies from 300 to 600 feet.

To illustrate the great trade and business done on this river, it is only necessary to give the output of timber and phosphate during the last twelve months:—

Railway ties, No.....	40,000
Cedar posts, No.....	30,000
Square timber, cubic ft.....	154,395
Lumber, ft. B. M.	46,500,000
Phosphate, tons.....	27,537
Mica, lbs.....	10,000
Feltspar, tons.....	50

The boats plying on this river, besides a large number of scows, are the "Agnes," "Eva," "Kate," "High Rock" and "River Belle."

It was with the intention of fostering, especially the phosphate industry, and facilitating its transport from the mines to the nearest railway, which is at Buckingham, that a contract for the construction of a lock and dam at the Little Rapids was entered into in December, 1886.

The lock and dam will be of sufficient height to flood the Long Rapids, about 7½ miles above the site of the lock, and will give an uninterrupted navigation of 22 miles from the village of Buckingham to the foot of High Falls.

The lock has a length of 160 feet between the gates, is 32 feet 7 inches in breadth, with 8 feet of water on the mitre sills. Entrance piers are also under construction.

A retaining wall has been built along the edge of the river to protect the lock wall.

Mooring piers, a guide pier and a wharf have been constructed at the upper end of the lock. The stone for the lock has been dressed and delivered at Buckingham Landing.

RIVIÈRE DU LOUP (EN BAS).

Rivière du Loup, in the County of Temiscouata, is situated on the south shore of the St. Lawrence, 108 miles below Quebec.

The channel of the river was deepened and small repairs made to the wharf.

RIVER L'ASSOMPTION.

The works done on the L'Assomption River consisted in two guide piers, one at the head of "Chute Monte à Peine," which has a length of 94 feet, and the other on the east side of the river at the foot of the falls, a length of 40 feet, and a large quantity of rock was blasted out. It is believed, that with these improvements the

logs will float easily down the "Chute" and not stick in it, as usual. Every spring at least 10,000 logs stuck in the falls and rapids, which were generally a loss to the lumbermen, as at low water some one would set fire to them.

About one-half mile above the "Chute" some protection works to the river banks are being made and are still in progress.

A channel 400 feet long and 40 feet wide was opened in front of McLaren's wharf, and other dredging done.

RIVER MEKINAC.

The River Mekinac takes its rise in Lake Mekinac, in the County of Champlain, and flows southward a distance of 18 miles, and empties into the St. Maurice, 49½ miles from the city of Three Rivers. Its depth varies from 1 to 12 feet.

There are several rapids on this river. One, which is 6 miles from its outlet, is about a mile long, and is called the "Rapid Blanc."

The communication between St. Roch and Les Grandes Piles in summer is by boat and in winter by the ice; from Grandes Piles the train, twice a day, carries passengers and freight to Three Rivers.

A number of boulders were removed from the channel in the first and second rapids above the mouth of the river.

RIVIÈRE OUELLE.

Rivière Ouelle, in the County of Kamouraska, is 33 miles above River du Loup and 75 miles below Quebec, on the south shore of the St. Lawrence.

The work at this place consisted in re-sheeting part of the head of the wharf at centre of outer face and under the landing-slip, and in re-planking part of the double landing-slip, on the easterly side of the wharf.

The re-sheeting of the two outer corners of the head of the wharf has also been commenced.

RIVER RICHELIEU.

The River Richelieu flows into the St. Lawrence at Sorel, on its southern shore, 45 miles below Montreal and 47 above Three Rivers.

The construction of an additional ice pier near the mouth of the river has been commenced, but was not completed at the close of the fiscal year.

RIVER ST. DAVID.

Some repairs were made to the abutments of the bridge which crosses this river, at the village of St. David, in the County of Yamaska.

RIVER ST. FRANCIS.

This river takes its rise in Lake St. Francis, in the County of Beauce. It flows south-west through the counties of Beauce and Wolfe, crossing the north-west corner of the County of Compton, and takes a sharp turn to the north-west at Lennoxville. It then flows through the counties of Sherbrooke, Richmond, Drummond and Yamaska, and empties into Lake St. Peter on its southern shore, 11 miles below the Isles of Sorel, and 3 miles from the mouth of the River Yamaska.

The bed of the river at its outlet is divided into several channels by a group of small islands.

During the year a further quantity of dredging was done opposite Tourville's mills and the wharf at St. Thomas de Pierreville, as well as at other points on the river.

RIVER ST. MAURICE.

The St. Maurice empties into the St. Lawrence at the city of Three Rivers.

A channel 2,800 feet in length, 30 feet in width and 9 feet deep at low water was dredged during the year in the western channel of the river up to the highway bridge.

RIVER YAMASKA.

This river takes its rise in the Township of Bolton, in the County of Brome. It forms an outlet for several large lakes, and has a course of about 90 miles. It flows through the counties of Brome, Missisquoi, Rouville, Bagot and St. Hyacinthe, Richelieu and Yamaska, and empties into the head of Lake St. Peter on its southern side, eight miles below Sorel.

A contract for the construction of a lift-lock and dam at Ile à Cardin, one mile and three-quarters below the village of St. Michel de Yamaska and about four and a-half miles from the mouth of the river, was entered into in the year 1880. This work was completed in 1886. It gives a rise of $5\frac{3}{4}$ feet.

By the construction of these works, and by dredging done subsequently on the shoal below the lock, the river has been rendered navigable for vessels of moderate draught up to Belle Point, or Rapide de la Grosse-Roche, a distance of twenty miles.

The heavy rains of September 1889 raised the water in the river to such a height that a break occurred in the dam. That portion which remained was repaired and strengthened, and the Petit Chenal was closed.

SHIP CHANNEL, RIVER ST. LAWRENCE.

The work in hand is the completion of the ship channel between Montreal and Quebec to a full depth, $27\frac{1}{2}$ feet, at low water, and the objective points are at Cap à la Roche, Pouillier Rayer and Cap Charles, where work was carried on during the last fiscal year. The maintenance of this depth of $27\frac{1}{2}$ feet also obtains with this Department, and it was found necessary to dredge in the channel above lightship No. 1 in Lake St. Peter, it having been reported that shoaling had taken place, and, after testing, this was found to be correct, and the accumulation, amounting to 13,375 cubic yards, was removed. The pilots having reported a deficiency in the depth at Pointe Citrouille, an accumulation of sand, amounting to 17,070 cubic yards, was removed.

The material in the vicinity of Cap à la Roche, being composed entirely of shale rock, hard pan and boulders, only four of the dredges composing the fleet and specially adapted for rock dredging, were available for the work, one of which was employed at Cap à la Roche in deepening on the "Curve," assisted by a second which worked in the softer part of the rock, both dredging to a depth of $27\frac{1}{2}$ feet at low tides. The material dredged consisted almost entirely of shale rock and amounted to 81,975 cubic yards, which, together with 200 cubic yards of large boulders lifted by stone lifters, cost an average of \$39.85 per cubic yard.

Between the rock bottom which is found at Cap à la Roche and Cap Charles there is a stretch of hard pan, tough clay and boulders at Pouillier Rayer which requires the service of a very powerful dredge to effect their removal. On this portion work was done by the dredges employed during the year, to the extent of 74,145 cubic yards, whilst the stone-lifters took away boulders aggregating 465 cubic yards, at a cost of \$34.88 per cubic yard.

At Pouillier Rayer one dredge worked during the whole of the working season, being assisted during part of the time by a second which was placed on the softer parts of the rock, for during the prosecution of the work it was found that the rock at the lower end of the channel was so hard that the usual cut of $2\frac{1}{2}$ feet had to be abandoned, and two cuts of 15 inches each had to be adopted to obtain the required depth. Only shale rock was dredged at this place, the quantity amounting to 82,410 cubic yards, which, with 337 cubic yards of boulders removed by the stone-lifters, cost \$39.19 per cubic yard.

In the Cap à la Roche to Cap Charles channel, the total length being about 18,000 feet, 8,800 feet have been completed to the full depth of $27\frac{1}{2}$ feet at low water.

After a careful examination at Grandines it was found that extremely dangerous obstructions in the shape of large boulders existed, and that their immediate removal was necessary for the safety of vessels passing the place at periods of low water. A stone-lifter was placed and worked nearly the whole of the season of

navigation, and removed 5,104 cubic yards of boulders, at a cost of \$1.50½ per cubic yard.

A steamboat channel was opened from the main channel to the village of Contrecoeur, a distance of 4,700 feet, the width in the straight portions being 100 feet, and at the bend varying from 125 to 150 feet, the depth, as tested at low water, being 8 feet. The total quantity of material—clay, sand and gravel—amounting to 116,200 cubic yards, being removed at a cost of \$6.52 per yard. A beacon has been erected on Ile Hurteau to range with the spire of the Contrecoeur church to indicate the straight portion of the channel; and two small ones have been placed on the main shore for guidance through the channel at the bend.

The details of work done, the dredging plant employed and expenses incurred, &c., will be found in the tables at the end of this report.

DISTANCES between Montreal and Quebec measured along the centre line of the Ship Channel.

	English Statute Miles.	Nautical Miles.
Montreal Island Wharf, opposite Custom House.....	0	0
Longue Pointe.....	6½	5½
Pointe-aux Trembles, en haut.....	10½	8½
Varennes.....	13½	11½
Cap St. Michel.....	15½	13½
Vercheres.....	21½	19
Plum Island Light.....	22½	19½
Contrecoeur Channel, upper entrance.....	28½	24½
Lavaltrie.....	30	26
Contrecoeur Channel, lower end.....	36	31½
Lacoraie.....	36½	31½
Sorel, opposite Light House.....	45	39
Ile de Grace Light.....	48½	42½
Stone Island Light.....	52	45½
Light Ship No. 1.....	57½	49½
do No. 2.....	60½	52½
White Buoy.....	64½	56½
Light Ship No. 3.....	71	61½
Port St. Francis.....	75½	65½
Three Rivers.....	81½	71
Beaucevoir, Iron Buoy at Bend.....	87½	75½
Champlain.....	93½	81½
Batiscan Wharf.....	101½	87½
Cap Levant.....	105½	91½
Cap à-la-Roche, centre of new channel.....	108	93½
Cap Charles.....	110½	96½
Richelieu Rapids.....	120	104½
Platen Wharf.....	124½	108½
St. Croix.....	130½	113½
Eoursuil.....	132	114½
Pointe-aux Trembles, en bas.....	139	120½
Cap Rouge.....	151	131½
Quebec Custom House Wharf.....	160	139

STE. ADELAIDE DE PABOS.

Ste. Adelaide de Pabos, commonly called Little Pabos, is an important parish in the County of Gaspé, the residents of which are engaged in fishing and farming.

In June, 1888, a contract was entered into for the construction of a strongly-built breakwater, 200 feet in length, to afford shelter to the boats engaged in the fishing industry in this locality, and the work has been satisfactorily completed.

ST. ALPHONSE.

St. Alphonse is at the head of Ha! Ha! Bay, River Saguenay, about 66 miles about its mouth.

The flooring of the end of the wharf at this place was renewed over an area of 77 by 55 feet, and other repairs effected.

STE. ANNE DE LE PÉRADE.

The river of St. Anne takes its rise in the County of Quebec. It crosses the counties of Portneuf and Champlain, and empties into the St. Lawrence on the north shore, at Ste. Anne de la Péraide, 54 miles above Quebec and 23 miles below Three Rivers.

This river is for the most part very shallow, and abounds in rapids. In the vicinity of its outlet the banks are low, but some miles farther inland they are much higher.

A further amount of dredging was done to improve the channel of this river.

STE. ANNE DU SAGUENAY.

Ste. Anne du Saguenay is in the county of Chicoutimi, on the River Saguenay, opposite Chicoutimi.

Timber required for the proposed wharf having been obtained during 1887-88, the work of construction was commenced during 1888-89, and a length of 77 feet was built.

This year a further length of work has been built, and on the portion finished, the flooring, mooring posts &c., have been placed, but the wharf is not completed.

ST. IRÉNÉE.

St. Irénée is a small village, in the County of Charlevoix, on the north shore of the St. Lawrence 81 miles east of Quebec and 9 miles west of Murray Bay.

In 1886 an isolated "block" was built, one-third of a mile west from the mouth of the river, at about 600 feet from shore at high water spring tides, in a depth of water at the outer end of 12 feet at low water spring tides.

The block is 80 feet by 32 feet, the greater dimension being parallel to the shore. Steamboats do not call at this place.

During the month of September, 1889, the sum of \$501.73 was expended in removing boulders from the mouth of the river in order to allow schooners to winter safely therein, and the boulders removed were utilized in further protecting the entrance from north east winds.

Spring tides rise 20 feet; neap tides 12 feet 6 inches.

ST. LAURENT.

The village of St. Laurent is situated on the south shore of the Island of Orleans, in the County of Montmorency, 15 miles east of Quebec.

The construction of the wharf at this place was commenced in 1866. It is 583 feet long and 32 feet wide at the outer end with 6 feet of water at low water spring tides.

On the 4th of February last a contract was entered into with the Department for the construction of an additional length of 60 feet, 60 feet wide at the outer end and 50 feet at its junction with the old structure, but no work had been done at the close of the fiscal year. The depth of the water at the end of the new structure will be 9 feet at low water spring tides.

Spring tides rise 23 feet; neap tides 14 feet 6 inches.

ST. MICHEL.

St. Michel, on the south shore of the St. Lawrence, is in the County of Bellechasse, 16 miles below Quebec.

The work performed at this place consisted in the repairs of 220 feet on the easterly side of the wharf for a width of 12 feet, with an average of 9 feet in height.

ST. PLACIDE.

The western channel was deepened and the turning basin enlarged at the village wharf.

ST. SIMEON.

St. Simeon, County of Charlevoix, is on the north shore of the St. Lawrence, 108 miles below Quebec.

On 20th December, 1889, a contract was entered into for the construction of an isolated block 40 by 50 feet dimensions, with 13 feet at its outer end at low water spring tides, and at the close of the fiscal year the work was well under way.

Spring tides rise 20 feet; neaps $12\frac{1}{2}$ feet.

ST. TIMOTHÉE.

St. Timothée is situated on the south shore of the River St. Lawrence, in the County of Beauharnois. It is 6 miles east of Valleyfield and 9 miles west of the town of Beauharnois.

During the summer of 1889, the wharf which has a length of 100 feet, was extended out 45 feet, the extension being 45 feet by 100 feet. The steamers have no trouble in swinging round since the construction of the extension.

TADOUSSAC.

Tadoussac, or Anse à l'Eau, is at the mouth of the River Saguenay, on the southern bank.

The wharf at this place is 366 feet in length, with a width of 26 feet, the end block being 40 by 50 feet. The height of the wharf at the end is 29 feet, and there is a depth of $7\frac{1}{2}$ feet at extreme low water.

A further portion of this wharf was repaired and raised, 3 feet, the face timbers of the outer end were renewed and a temporary slip was constructed.

THREE RIVERS.

Three Rivers, the *chef lieu* of the County of St. Maurice, is 92 miles below Montreal and 72 above Quebec.

In November last a contract was entered into for the construction of a wharf between that of the Richelieu and Ontario Company and the Harbour Commissioners of Three Rivers, and at the close of the fiscal year the contractor had delivered a large amount of the materials required.

TROIS PISTOLES.

Trois Pistoles is in the County of Temiscouata, on the south shore of the St. Lawrence, 148 miles below Quebec.

The 60 feet extension to the wharf commenced in 1888 has been completed, and another extension of 50 feet square has been commenced.

ONTARIO.**BOWMANVILLE.**

Bowmanville, Durham County, is on Lake Ontario, 42 miles east of Toronto.

A large amount of material was removed from this harbour by one of the Department's dredges and navigation materially improved thereby.

BRIGHTON.

Brighton, Northumberland County, is on Presqu'ile Harbour, Lake Ontario, 22 miles from Belleville.

During the year dredging was done between the bars and in front of the wharves at this place.

BURLINGTON CHANNEL.

This channel leads through Burlington Beach, and connects the waters of Lake Ontario with Burlington Bay which forms the harbour of Hamilton.

Necessary repairs were made to the piers, ferry slip and ferry scow, and a "warping buoy," to aid sailing vessels in leaving the channel, was placed in position.

CHAUDIERE BRIDGE, OTTAWA.

The reconstruction of the Chaudiere Bridge, across the Ottawa River, known as the Suspension Bridge, has been carried on by the contractors, Messrs Rousseau & Mather, proprietors of the Montreal Bridge Company, since August, 1889, and was completed about the end of December, 1889.

The extreme length of the bridge is 236 feet, and the span between abutments 229 feet in the clear. The bridge has a roadway of 30 feet clear width, with two foot paths of 5 feet. The girders have fourteen panels with a depth of 30 feet.

COBOURG.

The harbour of Cobourg, in the County of Northumberland, is situated on the north shore of Lake Ontario, some 96 miles west of Kingston and 72 miles from Toronto, in the electoral district of West Northumberland.

During the past fiscal year the outer end of the west pier was rebuilt and the central pier of the old harbour repaired.

COLLINGWOOD.

Collingwood is on the southern shore of the Georgian Bay and 94 miles from Toronto.

During the past fiscal year a number of boulders of large size besides sunken logs were removed from the channel and other parts of the harbour. These boulders were spread over a large area and their removal has proved a source of much relief to vessels entering and leaving the harbour.

DRESDEN.

The Sydenham River empties into the Chenal Ecarté, River St. Clair, and at Wallaceburg divides into two branches, the northern one to Wilkesport, and the eastern past Dresden.

In September, 1889, a contract was awarded for the construction of sheet-pile protection work on the north-west side of the turning basin. At the close of the year the work was well under way, being nearly completed.

GODERICH.

Goderich, County of Huron, is at the mouth of the River, Maitland, which empties into Lake Huron, about 68 miles north of Sarnia.

General necessary repairs were made to the harbour works at this place.

KINCARDINE.

This harbour is situated on the eastern coast of Lake Huron, 31 miles north of Goderich, at the mouth of the Penetangore River.

In 1856 two parallel piers to form a harbour were built 100 feet apart, the northern pier being 540 feet in length and the southern one 290 feet, the latter being extended and completed in 1868.

During the past fiscal year the sheet-piling of the south and east side of the basin was completed, and the pile protection work on the inside of the northern pier was extended a distance of 200 feet northwardly.

KINGSTON.

Kingston is situated at the foot of Lake Ontario, 172 miles west of Montreal.

The work of removing Point Frederick Shoal was continued during the past fiscal year, and 233 scow loads, or 2,754 cubic yards of rock, were removed.

Early in the spring the four small scows engaged in this work were repaired in readiness for the season's work.

KINGSTON—DRY DOCK.

At the close of the fiscal year the bulk of the excavation—rock—had been completed, and a large quantity of stone delivered for floor, altars, &c., and much work done in the construction of wharfing, and in filling and grading the grounds.

On the 19th June, 1890, the corner stone was laid by the Right Hon. Sir John A. Macdonald, G.C.B., &c., assisted by the Honourable the Minister of Public Works.

KINGSVILLE.

Kingsville, Lake Erie, is distant 25 miles from the mouth of the Detroit River.

The flooring of the east pier being in a bad state, was repaired, to enable traffic to be carried on.

LITTLE CURRENT.

Little Current—the passage between Cloche Island and the Great Manitoulin Island—is on the direct route to Sault Ste. Marie for vessels taking the north channel instead of the outside passage on Lake Huron. It is distant from Collingwood about 140 miles.

The improvement of this passage or channel was resumed on the 25th September, 1889, and operations continued until 16th November, when they were suspended for the winter. They were resumed on 22nd May, and were in progress at the close of the fiscal year, 2,265 cubic yards of rock having been blasted and removed between the dates above mentioned.

Repairs were made to the plant, and a new scow with steam derrick was supplied, much to the efficiency of the work.

LITTLE NATION RIVER.

The Little or South Nation River flows through five counties in the eastern peninsula of the Province of Ontario—Grenville, Dundas, Stormont, Russell and Prescott, it empties into the Ottawa at Wendover.

Above the village of Casselman, in the County of Russell, the river is not navigable, but from that point to the village of Plantagenet, a distance of 36 miles, it is navigable, with the exception of a short distance at the mouth of Moose Creek, which flows into the Nation River. There existed a rocky shoal, extending over a length of 700 feet, over which there was only 2 feet to 2 feet 6 inches of water.

For the last four seasons work has been done towards the removal of this obstruction, which was completed in the summer of 1889, some 4,600 cubic yards of rock having been removed, besides a quantity of clay and alluvial deposit.

MEAFORD.

Meaford, an incorporated town in the County of Grey, is situated on the Georgian Bay, 18 miles west of Collingwood and 20 miles to the eastward of Owen Sound.

Prior to Confederation a pier 500 feet long, having 14 feet of water at its outer end, was built by the local authorities, aided by a grant from the Government. This pier, which is on the west side of the Big Head River, was extended 160 feet during 1874-75, and an arm 200 feet long was built in a north-easterly direction, in order to afford protection against north-east winds. A breakwater 410 feet long was also built on the east side of the river.

In 1878, and in 1880-81, the Department engaged in dredging to 12 feet inside the western pier, deepening the channel to the inner harbour, which had been partly dredged to 11 feet by the local authorities.

In 1883-84, 850 feet of sheet-piling were built on the west side of both the inner and outer harbour and substantial repairs made to the west pier, these repairs being completed in 1885. In 1886 further dredging was done, and in 1887-88 the town contributed \$3,000 and the Government \$5,000 to complete the dredging in the inner harbour to 13 feet and to dredge a 100-foot channel, 14 feet deep, to it from the outside, which work was completed.

In August, 1889, a contract was entered into for the construction of the following works:—

1. Cribwork, 80 feet in length and 20 in width, at the north end of the eastern breakwater.
2. Cribwork, 160 feet in length and 20 in width, at south end of the eastern breakwater.
3. Sheet-piling, 200 feet long, at the east side of the entrance to the inner harbour.

These were satisfactorily completed in May last, and a quantity of stone was placed in the pile work of the old breakwater, and a space between the breakwater and the shore was also filled with stone.

MIDLAND.

Midland, Simcoe County, is the terminus of the Midland Division of the Grand Trunk on the Georgian Bay.

In August last a contract was entered into for the construction of a further length of 2,000 feet of work on the harbour front, and was nearly completed at the close of the fiscal year.

NEWCASTLE.

Newcastle, Durham County, is on Lake Ontario, 47 miles east from Toronto.

The dredge "Ontario" operated during the year at this place deepening outside of the piers at the entrance to the harbour as well as the harbour itself.

OWEN SOUND.

Owen Sound, in the County of Grey, is situated at the mouth of the Sydenham River, and is the terminus of the Toronto, Grey and Bruce Division of the Canadian Pacific Railway. It is also the Georgian Bay port of this company's steamers plying to Port Arthur and the River Kaministiquia, as well as of other vessels, both steam and sail which navigate the Upper Lakes.

On the 9th October, 1889, a contract was entered into for dredging and other improvements in the harbour, and but little work was done, when in May last the contractor was relieved of the work and it was awarded to the next lowest tenderers.

At the close of the fiscal year the contractors had delivered a large amount of materials, and were getting their plant in readiness for active operations.

During April and May dredging was done over a part of the channel at the entrance to the harbour, which had become shoaled. The length dredged was 2,400 feet on a width of 60 feet, and to a depth of 16 feet 5 inches at lowest water.

PORT ALBERT.

Port Albert, at the mouth of Nine Mile Creek, is situated on the eastern shore of Lake Huron, about 9 miles north of Goderich.

A small pier was first constructed by the local authorities, and in 1875 the Department built an addition thereto of 50 feet in length, and constructed a small breakwater of crib-work, 75 feet long, on the south side of the creek. In 1881 and 1882 a row of close-piling, 300 feet in length, was driven from the eastern corner of the pier eastwardly, and the basin so formed dredged to a depth of 10 feet.

During the fiscal year 1882-83 the improvements were further continued, earth and clay being deposited behind the works on the northern side of the harbour and 90 feet of close-piling driven at the eastern end, in addition to the construction of other work.

In 1884-85-86 and 1888-89 further repairs were made, and 300 feet of close sheet-piling built on the eastern side of the north pier, to prevent earth from sliding into the harbour.

During the past year a small amount was expended in filling in two washouts, one on the north and one on the south side of the entrance to the harbour.

PORT ARTHUR.

Port Arthur, at the head of Thunder Bay, situated as it is at the head of Canadian navigation on Lake Superior, has become a very important place, and the point—for the River Kaministiquia and the facilities for shipment which it affords is now incorporated as part of the harbour of Port Arthur, under the Customs regulations—through which all the products of the North-West must pass, either by land or by water; and for the purpose of protecting the wharves and the harbour proper the construction of a length of 2,000 feet of the proposed breakwater was commenced in 1884 and carried successfully to completion in February, 1886.

In February, 1887, the construction of a further length of 1,600 feet, in addition to the work completed in the previous year, was commenced, and finished in November, 1888; and a talus of stone was placed against the outside of the work, which has added to the strength of the structure, as has been proved during the many furious storms which have occurred since it was put in place.

In October, 1888, a contract was entered into for the construction of a further length of 1,500 feet of breakwater, with block piers at each end, to the westward of the work already completed, an opening of 350 feet in width being left between the old work and the new to permit vessels to enter the port.

In May, 1889, operations on this new work was commenced, and up to the close of the fiscal year 300 feet had been constructed.

A commencement was made to extend the talus of stone along the front of the work built under the first contract, it having been found that the bottom was eroding under the action of seas during heavy gales. It may here be mentioned that this breakwater has successfully withstood the force of breaking seas driven by gales travelling at the rate of 54 miles an hour, and also ice shoves from the outer bay, when the ice has been pushed completely over the structure and left remaining thereon to a height of 19 feet.

During the fiscal year ended 30th June, 1890, good progress has been made by Messrs. Kirby & Stewart on the 1,500 feet of breakwater commenced by them in May, 1889, and the whole will be completed within the time specified in their contract.

A large amount of heavy stone was placed as a talus in front of the old work as well as in front of that under construction.

The depth at low water in the central opening is 18 feet; at the north-east opening, which is 250 feet wide between the end of the breakwater and the Canadian Pacific elevator wharf, the depth is 17 feet; and, after the completion of the length—1,500 feet—now under contract, there will be a depth of 17 feet at the western end, with ample room for steamers and vessels to pass.

PORT HOPE.

Port Hope is on Lake Ontario, 7 miles above Cobourg and 103 above Kingston. The superstructure of the Railway Wharf, so called in this harbour, received a large amount of repairs and reconstruction.

The Departmental dredge "Ontario" operated during the fiscal year in this harbour improving the navigation and giving a depth of from 12 to 14 feet.

PORTSMOUTH.

Portsmouth is situated on Lake Ontario, 2 miles west from Kingston.

The work of re-building the superstructure of the pier at this place was continued from 1st July to 26th October, 1889, during which time 2,032 feet of face-timbers, 1,421 of cross and longitudinal ties, and 340 cubic yards of stone filling were used.

RIDEAU RIVER, NORTH BRANCH.

The dredging referred to in my report of last year has been continued, and the navigation up to the Town of Kemptville materially improved, a basin being formed as well in front of the proposed wharf.

RIVER KAMINISTIGUIA

This river empties into Thunder Bay, Lake Superior, to the westward of Port Arthur.

During the past fiscal year a further amount of dredging was done in the river to better accommodate the large steamers now plying on these waters.

RIVER OTTAWA, BETWEEN PEMBROKE AND THE PETEWAUA RIVER.

During the last fiscal year the dredging of the shoal which obstructed the channel leading to the Culbute Canal was carried on.

The dredge commenced operations on the 17th August and closed on the 26th October, 1889. During that time 2,216 cubic yards of sand and gravel were removed. To indicate the new channel way, which has a depth of 8 feet, ten buoys were placed on the north side of the channel.

SAULT STE. MARIE.

Sault Ste. Marie, Algoma County, is at the head of the St. Mary's River, which connects Lakes Huron and Superior.

As stated in my report of last year, the work of extending the wharf at this place a distance of 150 feet into the river was completed.

The old approach to this extension, which was in a bad state, was partly renewed during the last fiscal year.

SOUTHAMPTON.

Southampton, in the Electoral District of North Bruce, is situated at the mouth of the Saugeen River, which empties into Lake Huron, 143 miles above Sarnia, and is the terminus of the Wellington, Grey and Bruce branch of the Grand Trunk Railway.

In December last a contract for the construction of an addition of 200 feet to the landing pier and necessary dredging was entered into, but at the close of the fiscal year little progress had been made by the contractors.

SUMMERSTOWN.

Summerstown, Glangary County, is on the north side of Lake St. Francis, 10 miles below Cornwall.

During the summer of 1889 the warehouse, commenced in 1888, was completed, and other works executed.

TORONTO.

The harbour of Toronto is formed inside of the Island, and has its principal entrance from the westward.

In 1788 the harbour was described to be nearly two miles in length from the entrance on the west to the isthmus between it and a large morass to the eastward. The breadth of the entrance was about half a mile, but the navigable channel for vessels was only 1,500 feet, having a depth of from 18 to 21 feet of water.

In 1832 Bouchette stated that the peninsula, now Toronto Island, was an extraordinary formation, being a narrow slip of land, in several places not more than 180 feet in breadth, but widening towards its western extremity to nearly a mile.

In 1833 changes in the state of the harbour were apparent, and the necessity for its preservation engaged the attention of those interested in its maintenance and improvement, who viewed with alarm the changes which had taken place in the peninsula, the encroachments of the shoal from Gibraltar Point northward and the narrowing of the entrance to the harbour. No action was taken, and in 1847 it was reported to the Department of Public Works that the entrance had narrowed to 250 feet, the bar having increased northwardly 280 feet in seven years.

In 1850 the harbour was put in commission, and early in 1852 it was reported that from the observations made and soundings taken during twenty years it was ascertained that the bar had advanced northwardly across the entrance at the rate of 19 feet yearly, and that the available width of the channel was scarcely 200 feet.

In 1853 an opening was made during a storm through the narrow beach at the eastern end of the harbour, and though it closed again in a short time afterwards, and attempts were made to give permanence to the beach, the whole was swept away and the eastern entrance was formed, and in that year it was suggested that its improvement should be undertaken, for the purpose of saving time to vessels arriving from or departing to the eastward; and that there would be a tendency, by reason of the current created, to keep the harbour open later in the fall, and ensure an earlier opening in the spring.

In 1859 the harbour master reported that the harbour was bounded on the south by an island, with a navigable channel, east and west of it; that in the eastern channel there was a depth of 8 feet at low water, and if properly buoyed might be navigated at night. In 1860 the western channel was dredged to a width of 400 feet and an average depth of 12 feet. In 1862 the eastern entrance had increased to half a mile in width, and a bar had formed which had shoaled the water.

Between 1874 and 1880 the sum of \$49,120.90 had been expended, principally in increasing the width and depth of the western entrance, and a certain amount of blasting for the removal of solid rock was executed.

In 1881 an examination of the harbour was made by the late Mr. Jas. B. Eads, C.E., who submitted a carefully prepared report, in which he advised the closing of the eastern entrance and the construction of works at the western entrance, to obtain and maintain a depth of 18 feet at low water; but before any action could be taken on these suggestions the marshes bounding the eastern side of the harbour, and the whole of the southern shore of the island, were damaged to such an extent as to necessitate a complete departure from the plans prepared by Mr. Eads, and attention had to be paid to the protection of the eastern side of the harbour, and the preservation of the eastern portion of the island, where it was the narrowest, and through which several breaches had been made. In 1882 work for the protection of the harbour, extending from the Don southwardly to Fisherman's Island, and for the protection of the island, over a length of 6,500 feet, were commenced, and were brought to completion in 1885.

In May, 1889, a contract was entered into for improving the eastern entrance, the works required consisting of the dredging a channel 300 feet in width to a depth of 12 feet below low water, the construction of protection works on either side of the new channel, and the continuation and completion of the harbour protection

works on the eastern side of the proposed entrance—extending from Fisherman's Island westwardly to a junction with the channel works; and at the close of the year dredging was well under way.

During the past fiscal year a channel 250 feet in width and to a depth of 12 feet was dredged through the gap, 122,000 cubic yards of sand having been removed.

The contractors have delivered materials for the piers, and framing of cribs had been commenced.

A large quantity of heavy stone was placed in the talus in front of the breakwater at the island, a total length of 3,700 feet having been thus protected. Work done by day's labour, under direct charge of the Department.

WIARTON.

Wiarion, Bruce County, is situated at the head of Colpoys Bay (Georgian Bay), about 32 miles north of Owen Sound, and is the terminus of the Georgian Bay and Lake Erie branch of the Grand Trunk Railway.

The harbour is a natural one, extending 8 miles from its entrance to the town. It is protected at the mouth by three large islands—White Cloud, Griffith and Hay. The water is deep to within a few feet of the shore, and the harbour is clear of reefs, bars or shoals.

On the 8th November, 1889, a contract was entered into for the construction of a breakwater 380 feet in length and 25 feet in width, near the head of the harbour, on the west side, to afford protection to small crafts; and at the close of the fiscal year the work was nearly completed.

MANITOBA.

RED RIVER.

The channel of the river at its mouth was further improved during the year, and other places up the river where work was required were attended to by the departmental dredge.

THE WHITE MUD.

The mouth of the White Mud River is 9 miles north of Westbourne, in the County of Marquette. Westbourne is on the Manitoba and North-Western Railway, and is a place of transhipment to and from the lake in connection with the lake trade.

Several of the bars obstructing the navigation of the river were removed by one of the dredges of the Department.

NORTH-WEST TERRITORIES.

BATTLE RIVER BRIDGE—BATTLEFORD.

The bridge across this river, which has been in course of construction for the past two years, has been completed by the Department, the contractors having failed in the work they agreed to undertake.

BELLY RIVER BRIDGE—LETHBRIDGE.

Belly River Bridge is situated in the north-west quarter of Section 1, Township 9, Range 22, west of Fourth Principal Meridian and about 2 miles from the town of Lethbridge.

A contract having been entered into for its construction, work was commenced in October, 1889, and at the close of the fiscal year was so far advanced that it is anticipated it will be completed by the month of September, 1890.

BRITISH COLUMBIA.

THE COLUMBIA RIVER.

Below Revelstoke.—The work of removing snags from the channel of this river between Revelstoke and the Arrow Lakes was actively prosecuted during the autumn, winter and spring of 1889-90, and has resulted in ensuring the safety of navigation between the points above mentioned, and two large stern-wheel steamers—the “Kootenai” and “Lytton” ply between Revelstoke and Sproat's Landing, a point near the confluence of the Kootenay and Columbia Rivers, the starting point of the Columbia and Kootenay Railway, now in course of construction.

Above Golden.—In my report of last year this portion of the river was described, as well as the class of work undertaken for its improvement.

The work during the past fiscal year consisted in strengthening the dams built during 1888-89, and in the construction of others at various points.

At the salmon beds, where the greatest difficulty to navigation is experienced, a dam about 705 feet in length was constructed at the point where the river leaves the Lower Columbia Lake, in order to keep the water from flowing over the salmon beds and thus facilitate the excavation of a channel through them, which it was found difficult to do the previous year, owing to the large body of water flowing over them.

The work done has been of the greatest benefit to navigation.

THE COQUITLAM.

The source of the Coquitlam is Coquitlam Lake, whence it flows southwardly and empties into the Fraser on its northern side, about 5 miles above New Westminster. The river is not navigable for any distance from its mouth except for canoes, being very rapid.

The work of clearing timber jams and other obstructions from the channel which prevented the free flow of water, was continued during the year.

COWICHAN RIVER.

The Cowichan is one of the rivers of Vancouver Island, and distant from Victoria about 35 miles.

Operations for the purpose of straightening the channel of this river between the Somanos Indian village—a mile above the railway bridge—and the Quamichan Indian village, a distance of about 2 miles, have been continued during the past year with good results.

THE DRY DOCK—ESQUIMALT.

Although the number of vessels docked this year is not as large as that of last, the dock has been fully occupied. This reduction in the number of vessels using it was caused by the accident to H.M.S. “Amphion,” this vessel being in the dock 7 months and 10 days.

Two of Her Majesty's ships, the “Amphion” (twice) and the “Icarus” and seven other steamers, were docked and repaired during the fiscal year.

In addition to the new keel blocks and handrails, staunchions, &c., put up around the dock, considerable improvements have been effected by the staff over and above the usual work of attending to the dock and engines and keeping them in good order.

FRASER RIVER.

The sand banks at the mouth of the Fraser extend about 5 miles into the Straits of Georgia. According to the old Admiralty charts two channels formerly existed through these banks, the course of one being nearly west, and the other leaving the first about 2 miles from the mouth of the river, passing to the south and thence west to the straits. In time the north channel filled, leaving the tortuous south channel the only entrance to the river. After a lapse of years it was found that a deepening

of the north channel was taking place, and in 1886 works with the object of improving this channel were commenced, and have been steadily carried on.

The range of tide on the sand banks averages $12\frac{1}{2}$ feet, whilst the range in the river at 2 miles from its mouth is about nine feet. The current across the banks at strong ebb runs from $2\frac{1}{2}$ to 3 miles an hour, whilst during the periods of freshets it is increased to 5 miles per hour.

The work of improving the channel across the sand heads at the mouth of the river was continued during the past year, and a further length of dam was constructed; the channel is gradually improving, straightening and increasing in depth owing to the works constructed by the Department.

NICOL ROCK.

The harbour of Nanaimo is situated on the east coast of Vancouver Island, distant 73 miles from Victoria, by which it is connected by rail, and is important as the centre of the coal mining industry of the Province.

Three companies are at present in full operation, shipping coal from the port—the Vancouver Coal Company from their wharves in Nanaimo harbour proper, the Messrs. Dunsmuir & Sons, of the Wellington Colliery, from Departure Bay, 5 miles from Nanaimo, and the East Wellington Colliery, about midway between Nanaimo and Departure Bay.

Nicol Rock, lying about 450 feet north-west from the wharves of the Vancouver Coal Company, and about 120 feet east of their ballast wharf, was a source of danger to shipping, and a great impediment in the harbour, when the number and size of the vessels frequenting the harbour are taken into account, during the past year 419 steamers and 63 sailing vessels loading at the wharves of the Vancouver Coal Company, the shipments amounting to 248,070 tons.

The rock is composed of the grey sandstone which overlies the coal, and is much broken on top, and the strata have been found alternately hard and soft, thereby adding much to the difficulty of drilling and of breaking the rock up small enough for dredging.

During the last fiscal year the whole area of rock to be removed to give the required depth has been broken up with explosives, but there still remains about 1,500 tons to be raised and removed.

THE SOMAS.

This river rises in the northern part of what is known as the Alberni Valley, on the western side of Vancouver Island, and flows southwardly for a distance of about 20 miles through the valley, and empties into the Alberni Canal, an inlet of Barclay Sound, which is an arm of the Pacific Ocean.

The settlement on the Somas can be reached by water from Victoria *via* the Straits and Cape Beale, and by waggon road from Nanaimo, which leaves the east coast of the island near the mouth of Englishman's River, and strikes directly across country, climbing over the height of land, 1,100 feet above the sea. The distance from Victoria to Alberni by sea is about 140 miles, and by land 130 miles, 78 of which are covered by the Esquimalt and Nanaimo Railway.

During 1888-89, 47 snags were removed from the channel of the river, and many overhanging trees were cut away between the mouth and the landing, which have increased the facilities for navigation; and the remains of an old mill dam near Sproat's Lake, which caused the adjoining lands to be overflowed, were removed.

During the fiscal year ended 30th June, 1890, the work of improving the navigation was continued, 38 snags being removed from the channel and 13 overhanging trees cut and taken from the banks.

VICTORIA HARBOUR.

The entrance to the harbour of Victoria is very narrow, with a sharp turn after passing the lighthouse. This turn was the cause of much difficulty to vessels, especially large steamers, entering the harbour during the prevalence of strong south-

west winds, and was due to the existence of a shoal extending from Shoal Point, which for a long time was supposed to be composed of solid rock, but in fact of a compact mass of boulders. It having been decided to operate on this shoal, iron pipes fitted with cast iron shoes were driven through and between the boulders with a small pile-driver to the required depth, and about 3 feet apart. These tubes were loaded with dynamite and exploded, after which a large harrow or rake, weighing about two tons, was dragged over the bottom, and then the dredge "Pacific" was able to work freely through the shoal.

This work was continued during the last fiscal year, the dredge "Pacific" and a clam shell being employed.

SURVEYS AND EXAMINATIONS.

During the year surveys and examinations were made at the undermentioned localities; and with some exceptions, plans, reports and estimates have been submitted.

St. Peter's Bay.	King's Co.	P. E. I.	River St. Louis,	Beauharnois Co.	P. Q.
Souris	do	do	Cross Point,	Bonaventure Co.	do
Summerside Harbour,	Prince Co.	do	Oak Point	do	do
Tignish Harbour	do	do	Ile aux Coudres,	Charlevoix Co.	do
Hope River,	Queen's Co.	do	Island of Alma, Lake St.	Chicoutimi Co.	do
New London	do	do	John,		
Pinette River	do	do	Mistook and Ile d'Alma,		
Port Selkirk	do	do	St. John	do	do
Wood Islands	do	do	Roberval, Lake St. John	do	do
Apple Creek,	Albert Co.	N. B.	St. Gedeon	do	do
Elles Island,	Charlotte Co.	do	St. Henri	do	do
St. Andrew	do	do	St. Jérôme	do	do
Miscou Harbour,	Gloucester Co.	do	St. Louis de Metabetchou-		
Miramichi River,	Northumberland Co.	do	uan, Lake St. John,	do	do
Negro Point Breakwater,	St. John Co.	do	Cap Chat,	Gaspé Co.	do
Oromocto Shoals, St. John			Cannes des Roches	do	do
River,	Sunbury Co.	do	Newport	do	do
Pointe du Chêne, Shediac,	Westmorland Co.	do	Ste. Anne des Monts	do	do
Clements Port (Moose R.)	Annapolis Co.	N. S.	River du Sud,	Iberville Co.	do
Mount Handley	do	do	Dorval,	Jacques Cartier Co.	do
Round Hill	do	do	St. Jean d'Orléans,	Montmorency Co.	do
Arisaig,	Antigonish Co.	do	Lake Mandeville,	Maskinongé Co.	do
McNair's Cove	do	do	Pond Creek, Hull,	Ottawa Co.	do
Tracadie	do	do	La Passe Bridge, River		
Great Village,	Colchester Co.	do	Ottawa,	Pontiac Co.	do
Partridge Island,	Cumberland Co.	do	Interprovincial Bridge,		
Partridge Island River,	do	do	Quoyon, Ottawa	do	do
Belliveau's Cove,	Digby Co.	do	Beaufort,	Quebec Co.	do
Church Point	do	do	River Blanche,	Kimouski Co.	do
Meteghan Cove	do	do	St. Edmond du Lac	do	do
Susiboo River	do	do	Cacouna,	Teniscouata Co.	do
White's Cove	do	do	Belœil Piers and Booms,	Vercheres Co.	do
Devils Island,	Halifax Co.	do	River St. Maurice,	Grands Piles to La	
Meagher's Beach	do	do		Tuque	do
Porter's Lake	do	do	River St. Maurice,		do
Ship Harbour	do	do	Lake of the Woods,	Algoma Co.	Ont.
West Chezzetcook	do	do	Rainy River	do	
Walton,	Hant's Co.	do	Sault Ste. Marie	do	do
Grand Etang,	Inverness Co.	do	Kincardine,	Bruce Co.	do
Margaree	do	do	Sauguen River	do	do
Ogilvie,	King's Co.	do	Warton	do	do
Pictou Island,	Pictou Co.	do	Kettle Creek,	Elgin Co.	do
Blanche,	Shelburne Co.	do	Kingsville,	Essex Co.	do
Purgatory Point	do	do	Big Bay, North Keppel,	Grey Co.	do
Port La Tour Canal	do	do	Meaford	do	do
Roseway River	do	do	Grand River	Haldimand Co.	do
Big Pond,	Victoria Co.	do	Narrows, Georgian Bay,	Muskoka	do
Boularderie	do	do	Beaver River,	Prescott Co.	do
New Haven	do	do	Pictou,	Prince Edward Co.	do
North River	do	do	Thames River,	do	do
South Gut	do	do	St. Clair River,		
Ingonish	do	do	Columbia River (Revel a-		B. C.
Sanford or Cranberry Head	Yarmouth Co.	do	take)		
Soney Island, Cape Sable	do	do	Skeena River		do
Island	do	do	Fraser River (opposite		
Yarmouth	do	do	Ladner's Landing)		do

DREDGING.

"THE ST. LAWRENCE."

At the beginning of the fiscal year this dredge was operating on the "Traverse," River Restigouche, Restigouche County, N.B., and continued work until the 21st August, removing 18,350 cubic yards of sand, mud, clay, boulders, &c. On the 22nd work on the basin at the public wharf, Dalhousie, was resumed and continued, and a passage to the main channel was opened, the whole being completed on the 21st October. Having been ordered to Lockeport, Shelburne County, N.S., the dredge arrived and commenced work on the 12th November, in improving the harbour in front of the town and towards the light at the entrance, to a width of 100 feet and a depth of from 10 to 12 feet at low water, and up to the 21st December 6,563 cubic yards of mud and sand were removed.

Wintering at Halifax, N.S., extensive repairs were made to the engines, boilers, and machinery, and to the hull, and on the 26th May, 1890, dredging commenced in the entrance from the main channel up to the city market wharf in the harbour of Pictou, N.S., and at the close of the fiscal year a channel 900 feet in length and 40 to 45 feet in width had been made to a depth of 15 feet at low water, and 18,700 cubic yards of mud, clay and boulders were removed.

The total quantity of work done during the year was 59,676 cubic yards, at an average cost of 25½ cents per cubic yard.

The sum of \$30, realized from the sale of an old anchor, was placed to the credit of the Receiver General.

"CANADA."

The "Canada," on the 1st July, 1889, was at Sherrow's Channel, Barrington, Shelburne County, N.S., and up to completion of the work on 6th July a further quantity of 720 cubic yards of mud was removed.

On the 9th July, work was commenced in front of the wharves at Rugged Island Harbour, Lockeport, N.S., and continued until 5th August, when a basin 800 feet in length, 100 feet in width and 11 feet deep at low water was completed, and 5,310 cubic yards of mud were removed.

Having been ordered to Richibucto, N.B., that place was reached on the 13th August, and work at once commenced on the North Channel and afterwards in the South Channel, the work done in which not being of much service, owing to the presence of a wreck, which ought to be removed by the proper authorities. Here 8,775 cubic yards of sand were removed up to the 16th October.

On the 3rd November work at Barrington, N.S., was resumed, and continued up to 15th December, when the channel was improved at the "bend" and deepened to 11 feet at low water, and a passage opened from the main channel to Sargents wharf, the quantity of material (mud) removed being 7,740 cubic yards.

Work was resumed at Lockeport on the 15th December, and up to the 8th January, 1890, a further quantity of 1,350 cubic yards of mud was removed, and the work previously commenced completed.

The "Canada" wintered at Halifax, and repairs were made to the vessel and machinery. On the 27th May the work of widening and deepening the channel through the "bar," at the entrance to Mabou harbour was commenced, and continued until the 30th June, up to which date a further quantity of 3,960 cubic yards of gravel and sand was removed.

During the year a total quantity of 29,855 cubic yards of material was removed by this dredge, at an average cost of 37½ cents per cubic yard.

The sum of \$16.00, received from the sale of surplus coal at Richibucto, has been placed to the credit of the Receiver-General.

"NEW DOMINION."

On the 5th July, 1889, the "New Dominion" commenced work on the "flats," Grand Lake, N.B., in the removal of material which had accumulated in the channel,

and up to the 21st August had opened a cut 900 feet in length and 50 feet in width, to a depth of 14 feet, and removed 17,605 cubic yards of mud and sawdust.

At the latter date the plant was towed to the Oromocto Shoals, River St. John, remaining there until 6th October, where a cut or channel 1,000 feet in length and 50 feet in width and 14 feet in depth was completed, and 14,215 cubic yards of sand and mud were removed.

Work was again resumed on the "flats" in the Grand Lake, and a further cut 700 feet long, 50 feet wide and 14 feet deep was made, thus connecting the lake with the Jemseg (or outlet) channel, and 10,325 cubic yards of material were removed.

The plant wintered at St. John, N.B., and on examination it was found that the boiler, after 20 years of service, was unsafe, and a new boiler was contracted for and placed in the dredge, and this and the ordinary repairs occupied until the 21st June, 1890, when the work of improving the channel of the Kennebecasis, off Perry's Point, was commenced, but after only two day's work had been done the piston of the engine gave out, and it was only at the end of the year that the dredge was in working order again.

The total quantity of work done during the year amounted to 42,880 cubic yards, at a cost of 19½ cents per cubic yard.

A sum of \$380 received for use of scows by the Intercolonial Railway, was placed to the credit of the Receiver-General.

"PRINCE EDWARD."

At the commencement of the fiscal year the "Prince Edward" was engaged in deepening a berth alongside the railway wharf in the harbour of Charlottetown, in which vessels lie afloat at all times of tide and are enabled to discharge their cargoes into the railway sheds. This work was completed on the 24th July, when a further quantity of 3,795 cubic yards of clay, stone and mud were removed.

Between the 24th July and 5th August a basin was made at the Red Point wharf by the removal of 2,442 cubic yards of mud and sand.

On the 10th of August work commenced at South Rustico in opening a passage 600 feet in length to the wharf at that place, and on the 28th September, this passage, together with a loading berth alongside of the wharf, were completed, and 11,649 cubic yards of mud and sand were removed.

At North Rustico the "Prince Edward" was employed from the 29th September up to the 9th November in cutting a channel 840 feet in length and 57 feet in width through a "bar" in the harbour.

During the winter the plant was repaired, and on the 2nd June, 1890, work was resumed at North Rustico, and a further cut, 1,155 feet in length, 180 feet wide at the mouth and 114 feet wide at the end inside of the bar, was made to a depth of 11 feet at low water, spring tides. A "middle ground" off Durocher's wharf, and a second in front of Laird's wharf, were removed by the close of the year, the further quantity of material removed amounting to 6,120 cubic yards.

The total quantity of work done during the year amounted to 31,422 cubic yards, at a cost of 31½ cents per cubic yard.

An amount of \$1,312 received for work done at the railway wharf, Charlottetown, and the sum of \$100 for dredging at Messrs. Peake Bros' wharves, were placed to the credit of the Receiver-General.

"GEO. MCKENZIE."

This dredge, at the commencement of the fiscal year, was engaged in preparing a foundation for an extension of the wharf and in opening a basin at Arisaig, N.S., and only completed the work on the 14th August, the delay being due to storms and the very exposed position of the locality. The materials removed were rocks, stone and sand, and amounted to 2,640 cubic yards.

Between the 21st August and to 10th September, 4,680 cubic yards of stone, sand and mud were removed in cutting off a point near the breakwater, and in removing a portion of the middle ground at Main-a-Dieu, Cape Breton.

At Cow Bay the "Geo. McKenzie" was employed from the 11th to the 30th September in the channel and along the breakwater, and at the wharf belonging to Messrs. Archibald & Co., for which service that firm paid the sum of \$116.85, a total of 3,255 cubic yards of material having been removed.

A small amount (270 cubic yards) of work was done at the St. Peter's Canal, and in October the plant was placed in winter quarters at Hawkesbury, and the necessary repairs were effected.

On the 19th May, 1890, orders were sent to move the dredge to Big Tracadie, N. S., but the weather proving unfavourable it had to be taken back to Hawkesbury for safety. After a second attempt it arrived and up to the close of the fiscal year had made progress in improving the channel at the entrance of the harbour, having up to that date removed 4,595 cubic yards of clay.

During the year a total of 15,440 cubic yards of material of different kinds were removed, at an average cost of 26 $\frac{3}{4}$ cents per cubic yard.

The sum of \$5.25 received from the sale of an old boat, \$116.85 from Messrs. Archibald & Co., and \$19.08 from the I. C. Railway for scow hire, were placed to the credit of the Receiver-General.

"NIPISSING."

At the beginning of the fiscal year the "Nipissing" was engaged at St. Placide, Quebec, in deepening and cleaning up the western channel, and in increasing the size of the turning basin at the village wharf, and remained until the 20th July, having removed 6,660 cubic yards of clay and boulders.

At Pointe aux Anglais a channel was opened to a depth of 7 feet through a boulder shoal, principally by the means of a stone-lifter, and 3,240 cubic yards of boulders and 255 cubic yards of sand were removed.

Between the 19th August and 14th September channels east and west from the public wharf at Hudson were opened to the main channel with a depth of 7 feet, and 10,455 cubic yards of clay and boulders were removed.

After two days' work at Pointe aux Anglais in blasting and removing several large boulders, which owing to high water, could not be previously operated on, the plant was sent to Comò, commencing work on the 18th September in a channel in front and a turning place at each end of the wharf, removing 1,058 cubic yards of boulders, many of them of very large size, and 967 cubic yards of mud.

Work was resumed at Hudson on 5th October and completed on the 12th, up to which date a further quantity of 2,430 cubic yards of clay were removed, making a total of 12,855 cubic yards removed at that place during the fiscal year.

At Montebello work commenced on the 16th October and continued until the 8th of November, when a channel 525 feet long, 60 feet wide and 7 feet deep was completed through a clay bar, extending from the Ottawa to Kiernan's Bay, and 8,070 cubic yards of clay and mud were removed.

The dredge, tug and scows were laid up at Ottawa, and received repairs during the winter.

On the 22nd May, 1890, work was commenced inside of the wharf at Lachine and a cutting 210 feet long, 125 feet wide and 7 feet deep was made, and 9 old submerged piers, which were a serious obstruction to vessels sheltering on the northern side of the wharf, were removed. Dredging was also done in the channel north of the boulder shoal at the head of the Lachine Canal, to permit coal-laden barges and other vessels to approach the local wharves in that locality, and 3,059 cubic yards of boulders and 988 cubic yards of hard pan, clay and mud were removed, but the work was not fully completed at the close of the fiscal year.

The total quantity of materials of different kinds dredged amounted to 37,185 cubic yards, at an average cost of 16 cents per cubic yard.

"ST. LOUIS."

On the 2nd July, 1889, the "St. Louis" was at work in the mouth of the River L'Assomption, making a channel 400 feet in length in front of McLaren's Wharf,

Charlemagne, Quebec, and also a passage through the shoal at the foot of the island, removing 2,200 cubic yards of clay.

Between the 25th July and 19th September a channel 1,400 feet in length and 75 feet in width was cut through a shoal at the western end of Nun's Island, Chateauguay, and also a passage 150 feet long, 75 feet wide and 6 feet deep through the shoal at the eastern end of the island; and 4,900 cubic yards of sand were removed.

On the 15th September the plant was towed to Beauharnois, and worked there until the 23rd October, deepening the basin between the wharves at that place and improving the approaches thereto, removing 3,150 cubic yards of clay.

This plant wintered at Ottawa, and after the usual overhauling and repairing was sent on the 14th May, 1890, to Kemptville, Ont., to work in conjunction with the dredge "Queen," and remained there until the close of the fiscal year, operating principally in soft digging, and making a basin in front of the village wharf site, and finishing a channel 800 feet in length, to a width of 45 feet and a depth of 7 feet, removing 3,725 cubic yards of mud and clay.

The total quantity of work done during the year amounted to 13,975 cubic yards, at an average cost of 27½ cents per cubic yard.

"THE QUEEN."

At the commencement of the fiscal year this dredge was continuing the work of deepening and straightening the channel of the north branch of the Rideau River, from the Rideau Canal up to the Village of Kemptville, and continued here until the 28th October, when it was taken to winter quarters in Ottawa, where the usual repairs were made.

On the 17th May, 1890, work was resumed at Kemptville on a basin in front of the site of a proposed village wharf, and a channel thereto, the latter not been completed at the close of the fiscal year.

The materials operated on were very hard, and a large quantity of dynamite had to be used to break them up to permit their removal by the dredge. Very many boulders were met with, very many of large size, which were removed by a stone-lifter.

The total quantity of materials removed during the year amounted to 4,035 cubic yards, of which 2,502 cubic yards were boulders and 478 cubic yards hard pan, which had to be loosened with dynamite. The average cost per cubic yard was \$1.31½.

"THE ONTARIO."

This dredge and accompanying plant was engaged in July, 1889, at Port Hope, Ontario, in removing silt and sand which had accumulated in the channel between the mouth of the piers and the inner harbour, the work terminating on the 10th August, and the quantity of materials removed amounting to 10,000 cubic yards.

At Newcastle a cut 725 feet long, 25 feet wide and 12 feet deep was made alongside of the east pier, and a previous cut at the outer end was widened over a distance of 100 feet to a depth of 12 feet, the quantity of sand removed amounting to 4,560 cubic yards.

Between the 26th August and 25th September a cut 900 feet in length, and two cuts 575 feet in length, 70 feet in width and 12 feet in depth, were made through the harbour, on the west side of the east pier at Bowmanville, and 12,450 cubic yards of sand were removed.

Dredging commenced at Brighton on the 30th September, and a cut 125 feet in length, 25 feet wide, was made on the east side of the east wharf; another, 150 feet long and 25 feet wide in front of the west wharf, and a third 125 feet long and 25 feet wide on the west side of the west wharf; together with deepening and widening the basin between the wharves, and the removal of a stone in front, the whole to a depth of 12 feet of water.

The total quantity removed amounted to 3,920 cubic yards of mud, clay and gravel.

The plant wintered at Port Hope, and in the spring of 1890 received the necessary repairs, after which the season's work was commenced in the old harbour at that place on the 10th May, in making one cut 900 feet in length, 25 feet in width, through the centre of the harbour, and on a cut 225 feet in length at the end of the coal wharf, both to an average depth of 10 feet, the materials removed amounting to 1,180 cubic yards, thus making the total quantity dredged at this place during the year to amount to 11,180 cubic yards.

On the 21st May the plant returned to Newcastle, and commenced work outside of the piers, making one cut inwards through the harbour 850 feet long, 25 feet wide and 12 feet deep, the outer end being widened by an additional cut on either side for a length of about 200 feet, thus making the mouth of the channel 75 feet wide, with a depth of 14 feet. The material removed amounted to 6,120 cubic yards, making a total during the fiscal year, of 10,680 cubic yards.

Between the 12th and 30th June work was proceeded with at Bowmanville in making a cut 1,075 feet long, 25 feet wide and 12 feet deep, through the harbour on the west side of the east pier, removing 7,680 cubic yards of sand, and making a total of 20,130 cubic yards during the year.

The total quantity of materials removed during the year by this dredge amounted to 45,910 cubic yards, at an average cost of 13 cents per cubic yard.

THE "CHALLENGE."

On the 2nd July, 1889, the "Challenge" was working at Kincardine, Ont., in deepening between the piers at the mouth and in front of the salt works to 16 feet, and between the piers to within 100 feet of the basin, for the accommodation of the deep-draught vessels plying on Lake Huron; and from the latter point towards the bridge to a depth of 12 feet for the lighter-draught vessels carrying salt and lumber; the material (sand) removed, amounting to 11,160 cubic yards.

Between the 26th July and 5th August a berth 400 feet in length, 50 feet in width and 14 feet in depth, for vessels, was made alongside the wharf at Southampton, and 2,940 cubic yards of sand were removed.

At Port Elgin the plant remained until the 15th October, and made a channel 870 feet long and 175 feet wide, leading in line with the wharf from the inside of the harbour out to deep water, and also a berth for vessels along the east side of the wharf, removing 16,335 cubic yards of clay and sand.

On the 16th October the plant was taken to Goderich, where it was employed until the 5th November on the shoal off the entrance to the harbour, removing 1,620 cubic yards of sand.

After outfitting and repairs, work on the shoal at the entrance was resumed on the 28th April, 1890, and completed, after which a channel 1,000 feet in length, 75 feet in width, was opened between the piers, 600 feet of which was to a depth of 17 feet and 400 feet to a depth of 14 feet. Sand was the principal material removed, and amounted to 11,520 cubic yards, or a total of 13,140 cubic yards during the year.

It having been ascertained that the water in the channel at Kincardine had shoaled to such an extent as to prevent the entrance of deep-draught vessels, the "Challenge" was sent to that place on the 25th June, and continued up to the close of the fiscal year in obtaining a depth of 15 feet, removing 1,200 cubic yards of sand, thus making the total quantity dredged during the year amount to 12,360 cubic yards.

The total quantity of work done by this dredge during the year amounted to 44,775 cubic yards, at an average cost of 20½ cents per cubic yard.

THE "WINNIPEG."

The dredge "Winnipeg" commenced work on the 1st July at the mouth of the Red River and continued working until the 21st September. During this time it was engaged in widening the channel and otherwise improving it. After the above mentioned time it was removed to the Forks, where another cut was made through

the bar to improve the navigation, this work being completed on 26th October, on which date the dredge was removed to Selkirk, where work was done, several snags being removed and navigation otherwise improved, after which the plant was placed in winter quarters at the head of the West Slough.

The coal barge attached to the dredge received the necessary repairs, being caulked and the deck entirely renewed.

The quantity of material removed during the year was 65,880 cubic yards, at a cost of 14.047 cts. per cubic yard.

THE "PRIESTMAN."

During the year this dredge was employed in deepening the channel through the bars of the Whitemud River, the bar at the mouth of the river in Lake Manitoba having been sufficiently improved the previous year to allow the lake boats access to the river.

The quantity of material removed was 15,318 cubic yards, at a cost of 28½ cts. per cubic yard.

THE "PACIFIC."

During the past fiscal year the "Pacific" was employed in dredging off Shoal Point, Victoria harbour, in order to obtain 14 feet at low water spring tides, as well as increasing the width of the channel, and during the year 29,201 cubic yards of material were removed.

New boilers were placed in the dredge in the fall of 1889, and work was again resumed at Shoal Point on the 6th February.

THE "SAMSON"

The snag-boat "Samson" was employed during the year in removing the snags from the Fraser, between Harrison and the mouth of the river, and also in seeing that the buoys marking the channel across the Sand Heads were in their proper places. It was also employed in connection with the improvements at the mouth of the Fraser.

Various necessary repairs were made, and the plant put in good order.

DREDGING PLANT.

The dredging plant belonging to the Department is as follows:—

In the Maritime Provinces.

The steam hopper dredge "St. Lawrence."

do do "Canada."

The dipper dredge "New Dominion" and 8 scows.

do do "Prince Edward" and 6 scows.

do do "Geo. McKenzie" 5 scows and one 1 water scow.

Also 5 old scows belonging to the lost dredge "Cape Breton."

In Quebec.

The dipper dredge "Queen," 2 scows, and tug "Sensation."

do "Nipissing," 2 scows and tug "Ottawa."

do "St. Louis," 2 scows, living scow, and tug "Davis."

The sand dredge "Octopus."

Stone lifters Nos. 1 and 2.

Ship Channel, River St. Lawrence.

Six elevator dredges, tugs "John Pratt," "St. James," "St. Francis," "St. Paul," "C. J. Brydges," "Minnie Parsons," "Delisle," three stone lifters, two coal barges, one stone ship, twelve dump scows of 80 yards capacity, five scows of 150 yards capacity, one sounding scow and two flat scows.

In Ontario.

The dipper dredge "Challenge," 2 scows, and tug "Trudeau."
do "Ontario," 2 scows, and tug "Sir John."

In Manitoba.

Dredge "Winnipeg," tug "Sir Hector," and two scows and one coal barge.
Dredge "Protestant," tug "Victoria," and two scows.

In British Columbia.

The dipper dredge "Pacific," scows and tug "Princess."
The tug boat "Samson."

CLASSIFICATION OF Disbursements of the Dredge "St. Lawrence," during the Year ended 30th June, 1890.

Items.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Grand Totals.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Wages.....	406 48	504 81	509 97	505 52	513 33	508 33	456 50	245 33	245 33	376 32	509 97	506 34	5,382 23
Coal.....	190 00	190 00	245 00	384 55	.....	176 25	.....	.....	.....	.....	316 54	75 25	1,387 59
Provisions.....	260 84	180 49	132 83	408 32	.....	186 70	81 51	57 83	58 03	137 95	249 12	139 31	1,914 13
Stores.....	.....	.....	169 96	.....	.....	.....	110 00	.....	.....	26 37	270 39	.....	466 72
Equipment.....	23 44	.....	.....	.....	.....	.....	4 20	.....	.....	102 03	63 51	.....	238 98
Water.....	.....	.....	.....	20 20	.....	.....	.....	.....	.....	.....	10 20	.....	34 00
Repairs.....	.....	4 56	42 00	.....	84 46	.....	.....	.....	.....	.....	.....	.....	34 00
Pilotage.....	135 00	135 00	125 00	181 12	32 00	81 00	.....	.....	.....	.....	1,458 59	1,569 03	3,158 64
Towage.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	50 00	62 50	801 62
Wharfage.....	.....	.....	.....	.....	6 28	.....	.....	.....	.....	465 28	40 00	.....	505 28
Contingencies.....	.....	.....	.....	.....	.....	.....	.....	9 53	15 48	2 50	7 04	7 00	48 83
Totals.....	915 76	1,018 86	1,074 80	1,610 27	636 07	952 28	652 21	313 09	319 44	1,110 45	2,975 36	2,360 03	13,938 62
Working expenses.....	915 76	1,014 30	1,032 80	1,610 27	604 07	952 28	652 21	313 09	.....	2 50	1,182 87	791 00	9,071 15
Repairs, ordinary.....	.....	4 56	42 00	.....	32 00	.....	.....	.....	.....	.....	.....	.....	78 56
do extraordinary.....	.....	.....	.....	.....	.....	.....	.....	.....	319 44	1,107 95	1,792 49	1,569 03	4,788 91
Totals.....	915 76	1,018 86	1,074 80	1,610 27	636 07	952 28	652 21	313 09	319 44	1,110 45	2,975 36	2,360 03	13,938 62

Year	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	

CLASSIFICATION OF Disbursements of the Dredge "New Dominion" during the Year ended 30th June, 1890.

Items.	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.		Grand Totals.	
	\$	cts.	\$	cts.	\$	cts.	\$	cts.	\$	cts.	\$	cts.	\$	cts.	\$	cts.	\$	cts.	\$	cts.	\$	cts.	\$	cts.	\$	cts.
Wages.	504	33	497	75	491	25	495	89	362	39	155	00	157	50	150	00	155	00	155	00	313	90	406	63	3,844	64
Coal.			399	00																			160	00	460	00
Provisions.																							339	13	382	94
Stores.	14	64							5	02									24	09			412	00	701	35
Equipment.			39	04															250	31	96	09			437	50
Water.																										
Repairs.	5	65									12	23														
Pilotage.																										
Towage.	442	00	324	00	200	00	324	00	241	00													111	00	1,742	00
Wharfage.																					40	00			40	00
Contingencies.											15	68	3	25									7	30	26	83
Totals.	965	62	1,160	79	791	25	819	89	608	41	182	91	160	75	150	00	155	00	429	40	449	99	1,760	25	7,635	26
Working expenses.	960	97	1,109	79	791	25	819	89	608	41	170	68	160	75	150	00							815	16	5,637	90
Repairs, ordinary.	5	65									12	23													17	88
do extraordinary.																										
Totals.	965	62	1,160	79	791	25	819	89	608	41	182	91	160	75	150	00	155	00	429	40	449	99	1,760	25	7,635	26

CLASSIFICATION OF DISBURSEMENTS OF THE DREDGE, "George McKenzie," during the Year ended 30th June, 1890.

Items.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Grand Totals.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Wages	497 75	497 75	491 25	403 19	155 00	162 50	162 50	150 00	155 00	155 00	263 37	491 25	3,584 06
Coal										13 80	82 80		96 60
Provisions					11 04					36 63		36 63	155 58
Stores			71 28							211 58			278 11
Equipment			66 53									41 00	157 00
Water	26 00	40 00	44 00	6 00						65 63	186 54	220 55	516 62
Repairs	43 90												10 00
Pilotage		10 00										734 50	3,363 60
Towage			876 30	1,596 80		156 00							
Wharfage												5 00	43 46
Contingencies					38 46								
Totals	567 65	547 75	1,549 34	2,005 99	204 50	318 50	162 50	150 00	155 00	482 66	532 71	1,528 93	8,205 03
Working expenses	523 75	547 75	1,549 34	2,005 99	204 50	318 50	162 50	150 00		13 80	346 17	1,308 38	7,130 18
Repairs, ordinary	43 90												43 90
do extraordinary									155 00	468 86	186 54	220 55	1,030 95
Totals	567 65	547 75	1,549 34	2,005 99	204 50	318 50	162 50	150 00	155 00	482 66	532 71	1,528 93	8,205 03

CLASSIFICATION OF Disbursements of the Dredge "Nipissing," during the Year ended 30th June, 1890.

Items.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Grand Totals.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Wages.....	331 94	400 00	400 00	360 00	275 83	.....	.....	.....	.....	122 00	335 01	400 00	2,704 78
Coal.....	666 19	.....	246 94	159 01	.....	.....	.....	.....	.....	.....	.....	.....	1,012 14
Wood.....	3 70	.....	.....	115 25	.....	.....	.....	.....	.....	.....	.....	.....	118 95
Provisions.....	117 64	119 97	118 50	117 61	49 74	.....	.....	.....	.....	.....	63 91	129 82	717 19
Stores.....	.....	.....	9 17	19 79	.....	.....	.....	.....	.....	80 90	29 14	25 35	170 35
Equipment.....	53 95	17 45	12 62	.....	4 00	.....	.....	.....	.....	.....	169 27	.....	257 29
Repairs.....	18 99	32 13	3 15	10 25	.....	.....	16 90	.....	.....	302 81	263 45	17 75	670 43
Towage.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pilotage.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Contingencies.....	.....	14 23	.....	127 65	28 85	.....	.....	.....	.....	11 40	103 20	6 95	292 37
Totals.....	1,192 41	583 78	790 38	909 56	358 42	.....	16 90	.....	.....	523 20	988 98	579 87	5,943 50
Working expenses.....	1,173 42	551 65	787 23	899 31	358 42	.....	.....	.....	.....	.....	720 53	502 12	5,273 07
Repairs, ordinary.....	18 99	32 13	3 15	10 25	.....	.....	16 90	.....	.....	.....	50 25	17 75	152 67
do extraordinary.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	218 20	.....	517 76
Totals.....	1,192 41	583 78	790 38	909 56	358 42	.....	16 90	.....	.....	523 20	988 98	579 87	5,943 50

CLASSIFICATION AND DISBURSEMENTS OF THE DREDGE "St. Louis" FOR THE YEAR ENDED 30TH JUNE, 1890.

Items.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Grand Totals.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Wages.	325 00	325 00	320 00	380 00						129 00	231 13	325 00	2,045 13
Coal.	217 86		120 55	194 88								3 00	532 79
Wood.			3 00	6 50								94 55	12 50
Provisions.	38 70	192 34	108 74	33 40						72 48	49 69	14 70	547 33
Stores.		4 00	0 50							9 72	24 19		112 32
Equipment.				2 70						23 59	48 88		65 39
Repairs.	7 57		66 28	10 05							240 19	48 87	306 16
Pilotage.			3 00										3 00
Towage.	20 00												20 00
Contingencies.		27 40								6 75		100 00	134 15
Totals.	668 63	458 74	632 52	687 53						241 15	593 99	586 12	3,868 68
Working expenses.	661 06	458 74	565 24	677 48						217 05	353 89	537 25	3,472 52
Repairs, ordinary.	7 57			10 05						23 29	70 98	48 87	160 67
do extraordinary.			66 28								169 21		235 49
Totals.	668 63	458 74	632 52	687 53						241 15	593 99	586 12	3,868 68

CLASSIFICATION OF Disbursements of the Dredge "Queen" during the Year ended 30th June, 1890.

Items.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Grand Totals.
	£ cts.	£ cts.	£ cts.	£ cts.	£ cts.	£ cts.	£ cts.	£ cts.	£ cts.	£ cts.	£ cts.	£ cts.	£ cts.
Wages	365 00	365 00	365 00	315 00						168 00	229 52	312 50	2,130 02
Coal			156 39	142 81									299 20
Wood	0 75												0 75
Provisions	92 24	102 44	59 18	92 62							54 26	95 14	585 88
Stores	2 80	113 20	55 40	3 95						72 06	33 34	15 39	296 14
Equipment		6 05									47 19		53 24
Repairs	31 61	53 92	496 16	397 98	45 10					425 97	376 17	53 21	1,824 12
Pilotage													
Towage	100 00	6 65	6 95	17 20						10 68	46 40		196 98
Contingencies													
Totals	592 40	687 26	1,178 18	879 56	45 10					670 71	780 88	476 24	5,316 33
Working expenses	590 79	568 34	682 02	571 58						250 74	410 71	423 03	3,492 21
Repairs, ordinary			14 50	26 47						3 25	46 85	53 21	142 98
do extraordinary	31 61	53 92	481 66	281 51	45 10					425 72	323 62		1,661 11
Totals	592 40	687 26	1,178 18	879 56	45 10					670 71	780 88	476 24	5,316 33

CLASSIFICATION OF DISBURSEMENTS OF THE DREDGE "ONTARIO" DURING THE YEAR ENDED 30TH JUNE, 1890.

Items.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Grand Totals.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Wages.....	353 15	364 79	355 16	375 46	103 30	30 00	30 00	30 00	30 00	288 33	300 65	375 00	2,695 84
Coal.....	132 30		244 53								93 10		470 33
Wood.....					16 66						70 96	100 00	594 87
Provisions.....	101 45	100 00	100 00	105 80	8 38					118 51	53 77		297 52
Stores.....	12 74	11 48		2 64						67 99	116 13		184 12
Equipment.....										297 44	216 25	623 70	1,458 34
Repairs.....	82 35	10 60	258 90	7 60	1 50								7 00
Pilotage.....					7 00								7 00
Towage.....	75 00												75 00
Contingencies.....	35 61	4 25	172 65		49 95					11 35	7 75		281 56
Totals.....	640 30	623 42	886 71	736 43	186 79	30 00	30 00	30 00	30 00	743 62	918 61	1,098 70	5,974 58
Working expenses.....	577 35	612 82	627 81	728 83	185 29	30 00	30 00	30 00	30 00	486 18	702 36	475 00	4,516 24
Repairs, ordinary.....	44 45	10 60	21 30	7 60	1 50					88 49	126 74	40 85	341 53
do extraordinary.....	37 90		237 60							108 95	89 51	582 85	1,116 81
Totals.....	640 30	623 42	886 71	736 43	186 79	30 00	30 00	30 00	30 00	743 62	918 61	1,098 70	5,974 58

CLASSIFICATION and Disbursements of the Dredge "Challenge," for the Year ended 30th June, 1890.

Items.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Grand Totals.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Wagon	390 00	440 00	338 16	450 00	182 17	30 00	38 05	30 00	30 00	367 23	385 00	385 00	3,085 61
Coal	348 30	386 03	150 27	257 89	.....	.....	.....	.....	.....	136 12	438 04	616 19	2,372 84
Wood	4 75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4 75
Provisions	100 00	100 00	100 00	132 00	.....	.....	.....	.....	.....	.....	116 67	102 60	651 27
Storeroom	11 74	.....	27 41	14 83	.....	.....	.....	.....	.....	.....	34 43	.....	277 57
Equipment	24 98	.....	.....	.....	.....	.....	.....	.....	.....	.....	60 00	.....	153 30
Repairs	490 66	39 38	302 31	11 80	.....	.....	.....	.....	.....	1,063 15	29 40	297 15	2,233 85
Pilotage .....	.....	.....	.....	116 00	.....	.....	.....	.....	.....	.....	.....	.....	116 00
Tonnage .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Contingencies	5 40	109 40	60 95	24 15	.....	.....	50 25	.....	.....	70 49	7 29	35 50	363 43
Totals	1,364 09	1,080 55	999 10	1,046 67	182 17	30 00	88 30	30 00	30 00	1,894 56	1,070 83	1,436 44	9,258 71
Working expenses	873 43	1,047 17	696 79	1,034 87	182 17	30 00	88 30	30 00	30 00	831 41	1,741 43	1,139 29	7,024 86
Repairs, ordinary	67 51	.....	52 68	11 80	.....	.....	43 60	.....	.....	43 60	29 40	.....	204 90
do extraordinary	423 15	39 38	249 63	.....	.....	.....	.....	.....	.....	1,019 55	.....	297 15	2,028 86
Totals	1,364 09	1,080 55	999 10	1,046 67	182 17	30 00	88 30	30 00	30 00	1,894 56	1,070 83	1,436 44	9,258 71

STATEMENT showing Classification of Cost of Dredging on Ship Channel between Montreal and Quebec, for Fiscal Year ended 30th June, 1890.

Vessel.	Fuel.	Wages.	Board.	Stores and Materials.	General Repairs.	General Expenses.	Salaries and Office Expenses.	No. 1 Stone Lifter Service.	Extraordinary Repairs not charged to Dredging.	Total Cost.	Total Cost, including Tug Service.	Number of Working Days.	Cost per Day.	Number of Cubic Yards.	Cost per Cubic Yard.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.		\$ cts.		Cents.
Dredge No. 8.....	1,803 25	3,274 20	1,155 91	1,655 08	1,750 95	2,813 07	930 59	650 91	.....	14,033 96	.....	.....	.....	.....	.....
Proportion of tug service..	1,332 82	1,584 29	645 38	512 98	786 32	1,328 41	512 78	.....	.....	6,702 98	20,736 94	172	120 56½	64,935 31	93
Dredge No. 11.....	2,530 03	2,631 83	1,036 02	1,339 95	3,339 36	2,497 48	967 07	760 21	.....	15,492 55	.....	.....	.....	.....	.....
Proportion of tug service..	1,560 88	1,728 90	727 35	570 94	890 26	1,405 09	560 77	.....	.....	7,440 19	22,932 74	134	171 14	45,450 50	45
Dredge No. 12.....	2,105 72	3,134 29	1,255 11	1,743 44	3,432 05	3,396 39	1,117 89	765 95	.....	16,330 84	.....	.....	.....	.....	.....
Proportion of tug service..	1,604 76	1,917 00	778 14	625 59	941 84	1,606 28	615 25	.....	.....	8,068 86	25,019 70	177	141 35½	89,785 27	86
Dredge No. 13.....	3,137 67	3,120 12	1,252 25	1,775 24	3,207 77	3,482 56	1,154 76	802 81	.....	17,913 45	.....	.....	.....	.....	.....
Proportion of tug service..	1,702 65	2,030 52	826 29	660 89	998 01	1,701 04	650 57	.....	.....	8,569 77	26,483 22	160	165 52	68,905 38	49
Stone lifter No. 2.....	22 48	98 90	42 89	35 47	10 76	60 46	20 57	.....	.....	291 53	.....	.....	.....	.....	.....
Tug service.....	33 17	33 40	14 74	11 26	18 22	28 34	10 85	.....	.....	149 98	441 51	12	36 79½	134 83 25½	.....
Stone lifter No. 3.....	610 90	1,684 42	789 57	310 25	264 42	1,084 12	366 42	.....	.....	5,110 10	.....	.....	.....	.....	.....
Tug service.....	525 93	601 19	248 88	197 56	302 88	492 74	192 64	.....	.....	2,561 82	7,671 92	142	54 02½	5,104 81 50½	.....
Dredge No. 9*.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tug "M. F. Parsons".....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals.....	16,970 26	21,837 06	8,732 33	9,438 92	15,942 84	20,263 98	7,090 56	2,979 88	5,969 04	103,286 03	109,235 07	.....	.....	.....	.....

* Not working on ship channel in 1889-90. † Rebuilding.

CLASSIFICATION OF Disbursements, Dredging in Manitoba, for Fiscal Year 1889-90.

DREDGE "WINNIPEG."

Items.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Grand Totals.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Wages.....	570 00	570 00	570 00	570 00	300 00	80 00	80 00	80 00	557 00	575 00	.....	.....	4,042 00
Coal.....	723 45	729 75	759 50	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,212 70
Wood.....	.....	.....	.....	20 00	.....	.....	.....	.....	.....	.....	.....	.....	20 00
Provisions.....	292 28	292 28	282 86	292 28	141 43	.....	.....	.....	.....	255 71	.....	.....	1,536 84
Stores.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Equipment.....	.....	72 00	46 70	.....	.....	.....	.....	.....	486 86	.....	.....	.....	118 70
Repairs.....	6 85	40 00	15 25	79 58	11 55	.....	.....	.....	188 86	.....	.....	.....	500 51
Contingencies..	102 35	431 97	173 57	.....	116 92	.....	.....	.....	.....	.....	.....	.....	1,043 26
Totals.....	1,694 93	2,136 00	1,847 88	961 86	629 90	80 00	80 00	80 00	1,182 72	810 71	.....	.....	9,534 00
Working expenses.....	1,688 08	2,096 00	1,832 63	961 86	618 35	80 00	80 00	80 00	635 86	810 71	.....	.....	8,973 49
Repairs, ordinary.....	6 85	40 00	15 25	.....	11 55	.....	.....	.....	81 80	.....	.....	.....	155 45
do extraordinary.....	.....	.....	.....	.....	.....	.....	.....	.....	405 06	.....	.....	.....	405 06
Totals.....	1,694 93	2,136 00	1,847 88	961 86	629 90	80 00	80 00	80 00	1,182 72	810 71	.....	.....	9,534 00

DREDGE "PRIESTMAN."

Wages.....	370 00	370 00	370 00	370 00	185 00	30 00	30 00	30 00	.....	214 00	185 00	.....	2,155 00
Coal.....	.....	.....	441 37	.....	.....	.....	.....	.....	.....	.....	.....	.....	441 37
Wood.....	.....	.....	20 35	.....	.....	.....	.....	.....	.....	.....	.....	.....	20 35
Provisions.....	267 92	267 92	259 28	267 92	129 21	.....	.....	.....	.....	.....	94 28	.....	1,280 96
Repairs.....	20 75	10 60	2 95	.....	.....	.....	.....	.....	.....	.....	3 43	.....	37 73
Contingencies.....	36 17	174 46	154 35	23 41	.....	.....	.....	.....	.....	.....	9 25	.....	398 24
Totals.....	635 44	822 98	1,227 95	681 68	314 64	30 00	30 00	30 00	.....	214 00	292 96	.....	4,539 65
Working expenses.....	674 69	812 38	1,225 00	681 68	314 64	30 00	30 00	30 00	.....	214 00	289 53	.....	4,292 92
Repairs, ordinary.....	20 75	10 60	2 95	.....	.....	.....	.....	.....	.....	.....	3 43	.....	37 73
do extraordinary.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals.....	635 44	822 98	1,227 95	681 68	314 64	30 00	30 00	30 00	.....	214 00	292 96	.....	4,539 65

CLASSIFICATION OF Disbursements of the following Dredge, during Fiscal Year ended 30th June, 1890.

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" PACIFIC "

Items.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Grand Totals.
Wages.....	\$ cts. 615 00	\$ cts. 615 00	\$ cts. 355 50	\$ cts. 1,230 00	\$ cts. 615 00	\$ cts. 615 00	\$ cts. 985 00	\$ cts. 356 85	\$ cts. 1,220 00	\$ cts. 627 50	\$ cts. 615 00	\$ cts. 6,532 50	7,532 50
Coal.....					29 46						333 57	1,065 38	1,065 38
Water.....									4 00			4 00	4 00
Provisions..	123 70	115 80	12 36	260 44	138 70	70 60	134 47	12 30	211 93	131 61	10 51	222 81	222 81
Stores.....		26 65		24 07	74 18	25 75	23 80		22 45	129 60	225 33	1,533 94	1,533 94
Equipment..	6 17			8 41	61 49				69 82	24 95	118 73	315 63	315 63
Repairs.....	50 04	372 33		267 90	573 51	229 56		1,344 64	170 26	69 82	24 95	383 52	383 52
Pilotage.....									93 75		18 75	105 32	105 32
Towage.....												2,996 00	2,996 00
Wharfage..						15 00		20 00				17 50	52 50
Contingencies				9 00				4 00			16 00		29 00
Totals.....	794 91	1,129 98	367 86	1,739 82	1,492 34	340 91	2,524 21	832 79	1,435 43	849 16	1,477 87	12,985 28	12,985 28
Working expenses.....	744 87	757 45	367 86	1,531 92	918 83	111 35		1,179 57	739 04	1,435 43	830 41	1,372 55	9,980 28
Repairs, ordinary.....	50 04	198 18		267 90	54 87	90 90		150 62	93 75		18 75	105 32	970 42
do extraordinary.....		174 35			518 64	138 57		1,194 02					2,025 58
Totals.....	794 91	1,129 98	367 86	1,739 82	1,492 34	340 91	2,524 21	832 79	1,435 43	849 16	1,477 87	12,985 28	12,985 28

[1890]

CLASSIFICATION OF Disbursements of the Snag Boat "Samson," during the Year ended 30th June, 1890.

Items.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Grand Totals.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Wages.....	524 48	525 33						380 97	388 67			1,080 00	2,889 45
Coal.....	77 75							79 87	53 25			16 50	304 47
Wood.....								49 50					66 00
Water.....				22 02		6 80		102 24	141 65			203 63	934 73
Provisions.....	183 27	215 12							63 29				35 50
Stores.....	35 50							15 00	68 20				118 10
Equipment.....		24 81						122 33	9 28				1,935 95
Repairs.....	287 55	81 60		184 42					15 00			1,182 57	15 00
Pilotage.....													
Towage.....													
Wharfage.....				3 00									
Contingencies.....			5 40							8 70	13 20	19 75	50 05
Totals.....	1,108 55	846 86	5 40	209 44		6 80		749 91	730 06	8 70	131 08	2,562 45	6,359 25
Working expenses.....	821 00	765 26	5 40	25 02				627 58	661 86	8 70	121 80	1,379 88	4,423 30
Repairs, ordinary.....	50 20	81 60		184 42		6 80		123 33			9 28	21 20	478 03
do extraordinary.....	228 35								68 20			1,161 37	1,457 92
Totals.....	1,108 55	846 86	5 40	209 44		6 80		749 91	730 06	8 70	131 08	2,562 45	6,359 25

CLASSIFICATION AND QUANTITIES OF MATERIAL REMOVED BY THE FOLLOWING DREDGES, DURING THE YEAR ENDED 30TH JUNE, 1890.

"ST. LAWRENCE."

Description of Material Dredged.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Grand Totals.
	e. yds.	e. yds.	e. yds.	e. yds.	e. yds.	e. yds.	e. yds.	e. yds.	e. yds.	e. yds.	e. yds.	e. yds.	\$ cts.
Hard-pan	350	200	350	350								150	1,400
Boulders, stumps, &c.													
Gravel		1,213	4,900	5,250							1,575	7,700	20,638
Clay													
Clay and stone	5,425	4,375											9,800
Sand—ordinary					1,225	2,000							3,225
Sand—very fine	5,425	3,775	2,800		1,225	2,113					1,575	7,700	24,613
Mud													
Totals.	11,200	9,563	8,050	5,600	2,450	4,113					3,150	15,550	59,676

"CANADA."

Hard-pan													
Boulders												3,870	3,870
Gravel													
Clay													
Clay and stone											90		8,865
Sand—ordinary		3,330	4,140	1,305									15,120
Sand—very fine													
Mud	6,030				6,480	2,610							
Totals.	6,030	3,330	4,140	1,305	6,480	2,610					90	3,870	27,865

CLASSIFICATION and Quantities of Material removed by the following Dredges, &c.—Continued.

"NEW DOMINION."

Description of Material Dredged.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Grand Totals.
Hard pan													c. yards.
Boulders													
Gravel													
Clay	3,380	3,815											7,195
Clay and stone	3,060	4,000	10,485	6,167	980								24,632
Sand—ordinary	3,000	3,000		3,338	980							735	11,053
Sand—very fine													
Mud and sawdust													
Totals	9,380	10,815	10,485	9,505	1,960							735	42,880

"PRINCE EDWARD."

Hard pan													
Boulders													
Gravel												1,000	1,000
Clay	1,308												1,308
Clay and stone	1,297	231	2,128	4,920	2,496							5,120	14,895
Sand—ordinary													
Sand—very fine	3,015	6,435	3,482										12,932
Mud													
Totals	5,610	6,666	5,610	4,920	2,496							6,120	31,422

"GEO. MCKENZIE."

Hard pan.....	1,140		1,205									2,345
Boulders.....												1,848
Gravel.....		700	1,148									4,595
Clay.....												900
Clay and stone.....		630		270								4,492
Sand—ordinary.....		2,655	1,957									1,260
Sand—very fine.....												
Mud.....			1,260									
Totals.....	1,140	3,885	5,550	270								15,440

"NIPISSING."

Hard pan.....												218
Boulders.....	1,155	2,400	893	225								7,792
Clay.....	6,495	5,145	5,040	7,200	2,040					1,260		1,759
Sand, ordinary.....		255										26,235
Mud.....			742	1,485								255
Totals.....	7,650	7,890	6,675	8,910	2,040					1,260		458
												2,685
												37,185

"ST. LOUIS."

Clay.....	2,200		1,050	2,100						238		1,250
Sand, ordinary.....	375	2,750	1,775							862		1,375
Totals.....	2,575	2,750	2,825	2,100						1,100		2,625
												13,975

"QUEEN."

Hard pan.....	125	300								23	30	478
Boulders.....	353	447	375	478						206	643	2,502
Gravel.....	275											275
Clay.....										148	217	365
Clay and stone.....											415	415
Totals.....	753	747	375	478						377	1,305	4,035

CLASSIFICATION and Quantities of Material removed by the following Dredges, &c.—Continued.

"ONTARIO."

Description of Material Dredged.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Grand Totals.
	c. yds.	c. yds.	c. yds.	c. yds.	c. yds.	c. yds.	c. yds.	c. yds.	c. yds.	c. yds.	c. yds.	c. yds.	c. yds.
Boulders	595	765		680									1,990
Gravel				2,460									2,460
Clay	1,695	985											4,440
Sand, ordinary	5,360	7,290	9,810								3,730	10,670	35,370
Mud	360	210	390	480							1,180		3,130
Totals	8,710	8,440	10,110	3,620							4,910	10,670	45,910

"CHALLENGE."

Clay	5,250		4,560	2,025									11,835
Sand, ordinary	12,720	5,880		1,620						60	6,380	6,270	32,940
Totals	17,970	5,880	4,560	3,645						60	6,380	6,270	44,775

"PACIFIC."

Hard pan	200												
Boulders													
Gravel	2,620	850	800							600	720	630	
Clay													
Clay and stone	1,900	2,100	850							2,970	780	1,350	
Sand and gravel													
Mud								420	4,440	2,970	780	2,250	
					600			1,350					
Totals	4,720	2,950	1,650		600			1,770	4,440	6,540	2,290	4,230	29,210

DETAILS of Dredging in the Maritime Provinces

Dredge.	Locality.	County.	NEW BRUNSWICK.		
			Quantity.	Cost of each Work.	Total Cost.
			C. yds.	\$ cts.	\$ cts.
"New Dominion"	Grand Lake	Queen's	27,930	5,440 63	
	Oromocto	Simsbury	14,215	2,769 01	
	Kennebecasis	King's	735	143 21	8,352 85
"Canada"	Barrington	Shelburne			
	Lockeport	do			
	Richibucto	Kent	8,775	3,398 76	3,398 76
	Mabou	Inverness			
"Prince Edward"	Railway Wharf, Charlottetown	Queen's			
	Red Point Wharf	do			
	South Rustico				
	North Rustico				
"St. Lawrence"	Traverse	Restigouche	18,350	4,688 86	
	Dalhousie	do	16,063	4,104 46	8,793 32
	Lockeport	Shelburne			
	Pictou Market Wharf	Pictou			
"Geo. McKenzie"	Arisaig	Antigonish			
	Mainadieu	Cape Breton			
	Cow Bay	do			
	St. Peter's Canal	do			
	Tracadie	Antigonish			
			86,068	20,544 93	20,544 93

Dredge.	NEW BRUNSWICK.		NOVA SCOTIA.	
	Quantity.	Cost.	Quantity.	Cost.
	C. yds.	\$ cts.	C. yds.	\$ cts.
"New Dominion"	42,880	8,352 85		
"Canada"	8,775	3,398 76	19,080	7,390 11
"Prince Edward"				
"St. Lawrence"	34,413	8,793 32	25,263	6,455 28
"Geo. McKenzie"			15,440	8,976 16
	86,068	20,544 93	59,783	22,821 55

for the Year ended 30th June, 1890.

NOVA SCOTIA.			PRINCE EDWARD ISLAND.			Quantity by each Dredge.	Total Expenditure.
Quantity.	Cost of each Work.	Total Cost.	Quantity.	Cost of each Work.	Total Cost.		
C. yds.	\$ cts.	\$ cts.	C. yds.	\$ cts.	\$ cts.	C. yds.	\$ cts.
						42,880	8,352 85
8,460	3,276 75						
6,690	2,579 57						
3,960	1,533 79	7,390 11				27,855	10,788 87
			3,795	1,338 83			
			2,442	861 51			
			11,649	4,109 67			
			13,536	4,775 38	11,085 39	31,422	11,085 39
6,363	1,676 99						
18,709	4,778 29	6,455 28				59,676	15,248 60
2,640	1,534 78						
4,680	2,720 76						
3,225	1,892 32						
270	156 96						
4,305	2,671 34	8,976 16				15,440	8,976 16
50,783	22,821 55	22,821 55	31,422	11,085 39	11,085 39	177,273	54,451 87

PRINCE EDWARD ISLAND.		Total Quantity.	Expenditure Dredging.	Superintend- ence.	Total Expenditure.	Cost per Cubic Yard.
Quantity.	Cost.					
C. yds.	\$ cts.	C. yds.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
		42,880	7,635 26	717 59	8,352 85	0 19 479
		27,855	9,862 02	926 85	10,788 87	0 38 732
31,422	11,085 39	31,422	10,133 03	952 36	11,085 39	0 35 279
		59,676	13,938 62	1,309 98	15,248 60	0 25 552
		15,440	8,265 03	771 13	8,976 16	0 58 135
31,422	11,085 39	177,273	49,773 96	4,677 91	54,451 87	0 30 71

STATEMENT showing the Material removed at different localities, the Total Annual Expenditure on each Dredge, and the Average Cost per Cubic Yard, for Fiscal Year 1889-90.

DREDGE "WINNIPEG."

Date.	Localities.	Sand and Clay.	Totals.
1889.		c. yds.	c. yds.
July.....	Lake Winnipeg.....	5,640	
	do.....	2,880	
	do.....	3,240	
	do.....	3,300	
			15,060
August.....	do.....	5,700	
	do.....	2,400	
	do.....	4,920	
	do.....	3,720	
	do.....	2,520	
			19,260
September.....	do.....	4,860	
	do.....	3,960	
			8,820
	Total for Lake Winnipeg.....		43,140
do.....	Forks of River.....	4,140	
	do.....	2,760	
	do.....	3,120	
	do.....	4,620	
	do.....	5,380	
	Total for Forks of River.....		20,220
	Selkirk.....		2,320
	Grand Total.....		65,880

Total expenditure, \$9,534. Material removed, 65,880 cubic yards.
Average cost per cubic yard, 0 14½c.

DREDGE "PRIESTMAN."

Localities.	Hard Pan.	Boulders.	Gravel.	Clay.	Clay and Stone.	Sand, Ordinary.	Sand, Fine.	Mud.	Totals.
									c. yds.
Lake Manitoba.....	195			6,200	482	743			7,620
White Mud River.....	1,236			4,042	1,849	571			7,698
Totals.....	1,431			10,242	2,331	1,314			15,318

Total annual expenditure, \$4,389.65. Material removed, 15,318 cubic yards.
Average cost per cubic yard, 0 28½c.

* Clay and mud.

DREDGE STATEMENT, showing Material removed at different localities. Total Annual Expenditure on each Dredge and Average Cost per Cubic Yard.

DREDGE "CHALLENGE."

Location.	Hard Pan.	Boulders.	Gravel.	Clay.	Clay and Stone.	Sand, Ordinary.	Sand, Fine.	Mud.	Totals.
Kincardine.....						12,360			12,360
Southampton.....						2,940			2,940
Port Elgin.....				11,835		4,500			16,335
Goderich.....						13,140			13,140
Total.....				11,835		32,940			44,775
Total annual expenditure, \$9,258.71. Cost per cubic yard, 20½ cents.									

DREDGE "NIPISSING."

St. Placide.....		165		6,495					6,660
Point aux Anglais.....		3,240				255			3,495
Hudson.....		270		12,615					12,885
Cumy.....		1,058						967	2,025
Montebello.....				6,810				1,260	8,070
Lachine.....	218	3,059		315				458	4,060
Total.....	218	7,792		26,235		255		2,685	37,185
Total annual expenditure, \$5,943.50. Cost per cubic yard, 16 cents.									

DREDGE "ONTARIO."

Port Hope.....		1,290		1,980		5,560		2,350	11,180
Newcastle.....						10,680			10,680
Burnhamville.....						20,130			20,130
Brighton.....			680	2,460				780	3,920
Total.....		1,290	680	4,440		36,370		3,130	45,910
Total annual expenditure, \$5,974.58. Cost per cubic yard, 13 cents.									

DREDGE "QUEEN."

Kemptville.....	478	2,592	275	365	415				4,035
Total annual expenditure, \$5,316.33. Cost per cubic yard, \$1.31½ cents.									

DREDGE "ST. LOUIS."

Charlemagne.....				2,200					2,200
Chateauguy.....						4,900			4,900
Beaucharnois.....				3,150					3,150
Kemptville.....				1,488		2,237			3,725
Total.....				6,838		7,137			13,975
Total annual expenditure, \$3,868.68. Cost per cubic yard, 27½ cents.									

EXPENDITURE for Dredging in Nova Scotia for the Eighteen Years ended 30th June, 1890.

County.	Locality.	Total for the Seventeen Years ended 30th June, 1889.				For the Year 1889-90.				Total Quantities.	Total Cost.	Cost for each County.	
		Quantity.	Cost.		Quantity.	Cost.							
			C. yds.	\$		cts.	C. yds.	\$	cts.				
Antigonish	Antigonish	22,025	3,649	15				22,025	3,649	15		\$ cts.	
	Harbour au Pouchet	16,568	2,498	48				16,568	2,498	48			
	Tracadie	2,580	675	26				7,175	3,346	60			
	McNair's Cove	1,725	4,443	82			2,671	34	4,443	82			
	Bayfield	1,710	4,405	19					4,405	19			
Annapolis	Arising	900	2,318	52	17,990	42		3,540	3,853	30			
	Annapolis	2,825	1,635	68			1,534	78	22,196	54			
	Lingan	22,267	9,275	56					1,635	68			
	Sydney	54,600	17,781	54					2,825				
	Little Glacier Bay	46,450	16,936	02					9,275	56			
Colchester	Port Calichonia	17,413	8,242	21					17,781	54			
	Benacadie Pond	20,800	5,993	90					16,936	02			
	Christmas Island	19,045	3,364	98					8,242	21			
	Cox Bay				61,594	21			20,800	5,993	90		
	Mainland						3,255	1,892	32	19,045	3,364	98	
Cumberland	Tatamagouche	57,725	17,032	93			4,613	08	3,255	1,892	32		
	Parrsboro'	42,565	12,804	68					4,680	2,720	76		
	Wallace	60,835	14,573	49	27,378	17			57,725	17,032	93		
Digby	Digby	12,585	5,056	29					42,565	12,804	68		
	Guysboro'	5,400	1,413	53					60,835	14,573	49		
	Larry's River	26,230	6,546	70					12,585	5,056	29		
	Port Mulgrave	3,532	1,719	78					5,400	1,413	53		
	Sherbrooke	1,260	496	49	10,206	50			26,230	6,546	70		
Halifax	Chesetook	3,920	2,593	71					3,532	1,719	78		
	Halifax Ferry	6,177	2,063	38					1,260	496	49		
	Herring Cove	12,111	8,115	46									
	Ketch Harbour	2,989	985	39					5,400	1,413	53		
	Richmond Wharf	792	182	53					10,206	50			
Halifax	Roche's Wharf	1,750	620	28					1,413	53			
	Halifax Railway Terminus	19,290	6,187	38					6,546	70			

Port of Origin	Quantity	Value	Weight	Value	Weight	Value	Weight
Produce							
Wheat	1,000	8,000	8,000	8,000	8,000	8,000	8,000
Barley	1,000	4,000	4,000	4,000	4,000	4,000	4,000
Oats	1,000	3,000	3,000	3,000	3,000	3,000	3,000
Hay	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Butter	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Cheese	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Meat	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Wool	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Flax	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Grain	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Oil	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Wine	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Beer	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Spices	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Tea	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Coffee	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Gold	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Silver	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Iron	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Copper	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Lead	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Mercury	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Antimony	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Asbestos	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Flint	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Quartz	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Granite	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Marble	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Soap	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Shampoo	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Perfume	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Deodorant	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Body Lotion	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Facial Cream	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Hand Lotion	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Shower Gel	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Body Wash	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Shampoo Bar	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Deodorant Stick	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Body Powder	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Facial Powder	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Eye Makeup	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Lipstick	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Nail Polish	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Skincare	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Beauty Products	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Personal Care	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Household	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Food	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Drugs	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Medical	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Pharmaceuticals	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Chemicals	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Plastics	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Metals	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Textiles	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Leather	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Wood	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Stone	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Glass	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Paper	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Books	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Magazines	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Comics	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Video Games	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Software	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Electronics	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Appliances	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Furniture	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Decor	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Tools	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Automotive	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Aircraft	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Space	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Defense	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Energy	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Power	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Transportation	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Communication	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Media	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Education	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Health	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Environment	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Science	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Technology	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Art	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Music	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Sports	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Recreation	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Religion	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Philosophy	1,000	1,000	1,000	1,000	1,000	1,000	1,000
History	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Geography	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Language	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Mathematics	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Science Fiction	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Horror	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Mystery	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Thriller	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Adventure	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Fantasy	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Science Fiction	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Horror	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Mystery	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Thriller	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Adventure	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Fantasy	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Science Fiction	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Horror	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Mystery	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Thriller	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Adventure	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Fantasy	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Science Fiction	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Horror	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Mystery	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Thriller	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Adventure	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Fantasy	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Science Fiction	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Horror	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Mystery	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Thriller	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Adventure	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Fantasy	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Science Fiction	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Horror	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Mystery	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Thriller	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Adventure	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Fantasy	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Science Fiction	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Horror	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Mystery	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Thriller	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Adventure	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Fantasy	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Science Fiction	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Horror	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Mystery	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Thriller	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Adventure	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Fantasy	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Science Fiction	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Horror	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Mystery	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Thriller	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Adventure	1,000	1,000	1,00				

EXPENDITURE FOR DREDGING IN NEW BRUNSWICK FOR THE EIGHTEEN YEARS ENDED 30TH JUNE, 1890.

County.	Locality.	Total for Seventeen Years ended 30th June, 1889.				For the Year 1889-90.				Total Quantity.	Total Cost.		Cost for each County.	
		Quantity.		Cost.		Quantity.		Cost.			Total Cost.			
		C. yds.	\$	cts.	\$	C. yds.	\$	cts.	\$		\$	cts.	\$	cts.
Gloucester	Barbours ..	72,697	20,629	52	20,629	52				72,697	20,629	52	20,629	52
	Richibucto ..	57,697	17,159	78						65,872	20,538	54		
Kent ..	Cocagne ..	27,180	9,601	45		8,775	3,398	76		27,180	9,601	45		
	Buctouche ..	13,665	4,934	24						13,665	4,934	24		
	do Priest's Point.	3,510	1,110	70						3,510	1,110	70		
	do Chapel Point.	4,140	1,310	07						4,140	1,310	07		
Northumberland	do Robertson's Wharf	45	14	23	34,130	47			3,398	45	14	23	37,529	23
	Horse Shoe, Mir ..	190,417	44,594	13						190,417	44,594	13		
	Outer Bar, do ..	13,125	4,032	67						13,125	4,032	67		
	Grand Dune ..	37,975	10,121	67	58,748	47				37,975	10,121	67	58,748	47
Queen's ..	Grand Lake ..	65,625	10,332	33		27,930	5,440	63		93,555	16,372	96		
	do McMann's Cove.	20,440	4,222	82						20,440	4,322	82		
	Jonsg. ..	61,395	12,117	74						61,395	12,117	74		
	Wachluamook ..	48,375	6,340	83	33,913	72			5,440	48,375	6,340	83	39,354	35
Restigouche ..	Dalhousie ..	6,238	2,438	62		16,063	4,104	46		22,301	6,543	68		
	Traverse ..	11,050	4,319	78	6,758	40			8,793	29,400	9,068	64	15,551	72
St. John.	I. C. Railway terminus ..	139,810	37,130	01						139,810	37,130	01		
	Navy Island ..	25,294	9,296	79						25,294	9,296	79		
	Marble Cove ..	29,925	4,374	40						29,925	4,374	40		
	Murray's Mills ..	23,880	3,411	65						23,880	3,441	65		
Sunbury ..	Indian town Wharf ..	1,615	192	83						1,615	192	83		
	Long Wharf ..	7,137	2,680	24						7,137	2,680	24		
	Adams Wharf ..	7,513	3,267	25						7,513	3,247	29		
	Miller & Woodman's ..	9,275	1,650	42						9,275	1,600	42		
Westmoreland ..	Hayford & Stetson's ..	8,015	912	29						8,015	942	29		
	International Wharf ..	450	52	99						450	52	99		
	Anchor Line Wharf ..	4,635	996	81	63,445	63				4,635	996	81	63,445	63
	Oromocto ..	174,463	33,542	10	33,542	10			2,769	188,578	36,311	11	36,311	11
Westmoreland ..	Point du Chêne ..	33,750	9,432	00	9,432	00				33,750	9,432	00	9,432	00
	Point du Chêne ..	33,750	9,432	00	9,432	00				33,750	9,432	00	9,432	00

[illegible]

EXPENDITURE for Dredging in Prince Edward Island

County.	Locality.	For the Seventeen Years ended 30th June, 1889.		
		Quantity,	Cost.	Cost for County.
		C. yds.	\$ cts.	\$ cts.
King's.	Grand River.....	46,110	8,963 97	.....
	Montague River.....	106,140	17,119 43	.....
	Murray Harbour.....	44,430	7,378 33	.....
				33,461 73
Queen's....	Charlottetown Wharf.....	41,303	10,264 56	.....
	do Ferry.....	4,045	670 61	.....
	Crapaud.....	89,782	27,493 03	.....
	Pownal.....	44,400	9,604 55	.....
	Rocky Point.....	91,440	14,661 16	.....
	Vernon River.....	17,860	6,326 72	.....
	Wood Islands.....	2,780	548 00	.....
	Nine Mile Creek.....	31,650	6,286 46	.....
	Hickey's Wharf.....	750	150 51	.....
	Carr's Point.....	12,165	2,441 28	.....
	Pinette.....	3,825	756 24	.....
	Fort Augustus.....	3,195	631 68	.....
	South Port Ferry.....	33,015	5,528 75	.....
	Red Point.....	4,719	3,018 09	.....
	Charlottetown Steam Navigation Co.'s Wharf.....	7,668	4,904 15	.....
	Charl'town, Connolly's Wharf....	5,343	3,417 17	.....
	do Peake Bros. do	5,355	3,424 85	.....
	do P. E. I. Ry. do	1,155	738 69	.....
	North Rustico.....			.....
	South do.....			100,866 50
Prince.	Summerside.....	15,855	2,495 34	.....
	Hurd's Point Pier.	41,070	7,289 95	.....
	Tignish.....	11,387	13,005 45	22,790 74
Totals.		665,442	157,118 97	157,118 97

EXPENDITURE for Dredging in Quebec for the Eighteen years

Magdalen Islands, County Gaspé.	House Harbour.....	6,800	2,392 92	.....
	Amherst Harbour.....	495	242 05	.....
				2,634 97
Temiscouata..	River du Loup	2,587	825 47	825 47
Rimouski*.....	Rimouski.....	8,123	3,997 59	3,997 59
		18,005	7,458 03	7,458 03

*From amount voted Quebec dredging.

= the Eighteen years ended 30th June, 1890.

For the Year 1889-90.					
County.	Cost.		Total Quantity,	Total Cost.	Cost for each County.
	£	cts.	C. yds.	£	cts.
			46,110	8,963 97	..
			106,140	17,119 43	..
			44,430	7,378 33	..
					33,461 73
			41,303	10,264 56	..
			4,045	670 61	..
			89,782	27,493 03	..
			44,400	9,694 55	..
			91,440	14,641 16	..
			17,800	6,326 72	..
			2,780	548 00	..
			31,650	6,285 46	..
			750	150 51	..
			12,165	2,441 28	..
			3,825	756 24	..
			3,195	631 68	..
			33,615	5,528 75	..
2,002	861 51		7,161	3,879 60	..
			7,958	4,904 15	..
			5,343	3,417 17	..
			5,355	3,424 85	..
	1,338 83		4,950	2,077 52	..
	4,775 36		13,556	4,775 38	..
	6,169 67		11,649	4,169 67	..
		11,985 39			111,561 89
			15,855 1	2,495 34	..
			41,979 1	7,289 95	..
			11,587 1	13,006 45	..
					22,796 74
2,002	11,985 39	11,985 39	678,864	168,264 36	168,264 36

= the Eighteen years ended 30th June, 1890, from Appropriations—Maritime Provinces.

	6,800	2,372 92	
	495	242 00	
			2,634 92
	2,587	825 47	825 47
	8,123	3,997 59	3,997 59
	18,005	7,438 03	7,438 03

quantities of dredging in the Maritime Provinces at various dates, and the cost and expenditure for each dredging in the Maritime Provinces at various dates from 1870 to 1890.

Localities	Total Quantities from Years ended both June 30, 1890				Total Quantities from Years ended both June 30, 1890			
	Total Cost		Per Cubic Yard		Total Cost		Per Cubic Yard	
	Yds.	\$ cts.	Cu.	cts.	Yds.	\$ cts.	Cu.	cts.
" New Brunswick "	704,628	134,303 57	19 06	42 500	747,508	142,656 42	19 08	19 08
" Canada "	473,541	163,944 81	34 61	27 855	504,306	174,003 08	34 84	34 84
" Cape Breton "	534,508	131,074 33	25 99	31 422	534,508	131,074 33	25 99	25 99
" Prince Edward "	676,277	158,869 00	23 49	11,083 39	707,099	160,955 29	24 02	24 02
" St. John's "	918,074	195,787 26	30 07	29 676	977,740	211,000 36	31 13	31 13
" St. Lawrence "	335,660	117,738 31	35 07	15,440	351,136	126,714 47	36 08	36 08
	3,343,134	980,678 68	27 21	177,273	3,526,457	964,130 55	27 36	27 36

STATEMENT of Dredging performed by hand in the Maritime Provinces, showing Quantities removed and Expenditure at each Locality, for Eighteen Years ended both June, 1890.

Localities	Seventeen Years, from 1872-73 to 1888-89.				1889-90.			
	Total Quantity		Total Cost.		Total Cost.		Per Cubic Yard	
	Yds.	\$ cts.	Cu.	cts.	Yds.	\$ cts.	Cu.	cts.
Parish of N. S.	42,795	12,894 08	30 06	40 06	41,000	12,894 08	30 06	30 06
County of N. S.	5,440	1,927 00	29 86	29 86	5,440	1,927 00	29 86	29 86
	48,235	14,821 08	30 03	30 03				

Parish of N. S. 42,795 Yds. 12,894 08 \$ cts. 30 06 In 1888-89 and 1889, under the superintendence of Mr. Gray, 41,000 Yds. 12,894 08 \$ cts. 30 06 cost and quantity have not been supplied me.

APPENDIX No. 6.

REPORT

ON THE

SAGUENAY DISTRICT SLIDES AND BOOMS,

FOR THE FISCAL YEAR ENDED 30th JUNE, 1890.

BY

HENRY F. PERLEY, Chief Engineer,

AND

JOSEPH ROSA, Superintendent.



APPENDIX No. 6.

SLIDE, BOOMS, &c.—SAGUENAY DISTRICT.

Ref. No. 112972.

CHIEF ENGINEER'S OFFICE,
OTTAWA, 9th October, 1890.

Sir,—I transmit herewith a report by Mr. Joseph Rosa, Assistant Engineer, on the Saguenay Slide, for the fiscal year ended 30th June, 1890.

I have the honour to be, Sir,

Your obedient servant,

HENRY F. PERLEY,
*Chief Engineer.*A. G. BELL, Esq.,
Secretary, Department of Public Works,
Ottawa.

QUEBEC, 8th July, 1890.

Sir,—I have to report as follows on works executed at the Saguenay Slide, Lake St. Lawrence, for the fiscal year ended 30th June, 1890.

Repairs were made to the Slidemaster's house and other buildings, and to dams Nos. 2, 3 and 4, as well as to 148 feet of the lower end of the slide.

The number of logs of different dimensions which passed through the slide during the year was 67,300.

I have the honour to be, Sir,

Your obedient servant,

JOSEPH ROSA,
*Superintendent.*HENRY F. PERLEY, Esq.,
Chief Engineer, Public Works Department,
Ottawa.

APPENDIX No. 7.

R E P O R T

ON THE

ST. MAURICE DISTRICT SLIDES AND BOOMS,

FOR THE FISCAL YEAR ENDED 30TH JUNE, 1890,

BY

HENRY F. PERLEY, Chief Engineer,

AND

CHARLES LAJOIE, Superintendent.

APPENDIX No. 7.

SLIDES AND BOOMS—ST. MAURICE DISTRICT.

Ref. No. 109706.

CHIEF ENGINEER'S OFFICE,
OTTAWA, 7th July, 1890.

SIR,—I transmit herewith a report by Mr. C. Lajoie, Superintendent of the St. Maurice District Slides and Booms, on the works under his charge, for the fiscal year ended 30th June, 1890.

I have the honour to be, Sir,

Your obedient servant,

LOUIS COSTE,

*For Chief Engineer.*A. GOBEL, Esq.,
Secretary Public Works Department,
Ottawa.OFFICE OF THE ST. MAURICE WORKS.
THREE RIVERS, 7th July, 1890.

SIR,—I have the honour to transmit, for submission to the Honourable the Minister of Public Works, my annual report of the works executed on the St. Maurice under my superintendence, during the fiscal year ended the 30th of last June. I am happy to inform you that, in spite of the great height of water, no damage was caused to any of the works. The logs are being floated down the river without much difficulty; there is very little timber as yet in the boom; the total quantity will scarcely exceed 150,000 logs.

This year's expenses were not as high as last year's, and there remains an unexpended balance of \$1,168.29 from the appropriations of the same.

I have the honour to be, Sir,

Your obedient servant,

CHARLES LAJOIE,

*Superintendent.*HENRY F. PERLEY, Esq.,
Chief Engineer, Public Works,
Ottawa.

REPAIRS.

The repairs may be briefly described as follows :—

Entrance of the St. Maurice.

1. Pier No. 33 was built 3 feet higher and sheathed, on the four sides, with 3-inch planks for 15 feet in height=67 yards. 80 yards of stone and brush were placed at the bottom to prevent under-mining.

2. Twelve cross-heads of booms were renewed and connected by traverse cross-chains 24 feet long of $\frac{7}{8}$ inch iron.
3. Took off the old cross-heads of booms, repaired their extremities and provided gate-booms.
4. Two mooring posts planted on shore for the chains.
5. Forty yards of stone and brush for wharf at lower end of Caron Island.
6. Covering with shingles half of the roof on south-east side of the shed at the end of the island.

Cap aux Corneilles.

1. Re-sheathing with 3-inch planks, 750 feet of booms.
2. Graded a roadway up a hill, a distance of about 1,200 feet, for the service of the works.
3. One building, 24 feet by 15 feet, now used as an office and lodging by the boom master, together with a store, shed, and coach-house, 15 feet by 10 feet, have been provided for.

Shawenegan.

1. Repaired the bulkhead and trunk of the slide, at several places.
2. Renewed the small dam at head of the falls.
3. Repaired the long dam at head of falls.
4. Repaired the Grand Remous wharf at foot of the falls.
5. Reconstructed pier No. 14 of the retaining booms, 20 feet by 20 feet by 29 feet high above extreme low water.
6. Raised wharf at gateway of retaining boom, 6 feet high, 94 feet long and 10 feet wide.
7. Resheathed with 3-inch spruce deals 1,000 feet of booms, 4 feet wide, at head of the falls.
8. Resheathed with 3-inch spruce deals 118 feet of retaining booms 4 feet wide.
9. Made and placed 7 cross-heads on the booms, at head of the falls.

Grande Mère.

1. A pier 12 feet by 12 feet by 5 feet high filled with stone.
2. Repaired two pieces of booms 150 feet long by 3 feet wide.
3. Repaired a small pier at foot of the falls.
4. Construction of two boats, 32 feet and 22 feet long, respectively.

Grandes Piles.

1. Repaired pier No. 5, with two pieces of covering 22 feet by 18 inches and sheathed with 4-inch planks and 4,000 feet of boards.
2. Raised pier No. 6, 2 feet, 25 feet by 18 feet = 37 yards; 2 pieces of covering, 22 feet, sheathed with 4-inch planks and 4,000 feet of boards.
3. Raised pier No. 7, 2 feet, 25 feet by 18 feet; 2 pieces of covering 22 feet; sheathed with 4 inch deals, 4,000 feet of boards.
4. Raised pier No. 8, 2 feet, 25 feet by 18 feet = 37 yards; 2 pieces of covering 22 feet, sheathed with 4-inch planks and 4,000 feet of boards.
5. Raised pier No. 9, 4 feet in ice-breaker shape of 37 yards; sheathed with 4-inch planks and 4,000 feet of boards.
6. Raised pier No. 10, 4 feet, ice-breaker shape—37 yards; sheathed with 4 inch planks, and 4,000 feet of boards.
7. Raised pier No. 11, 4 feet, ice-breaker shape—37 yards; sheathed with 4-inch planks, and 4,000 feet of boards.

Expenditure for maintenance and repairs during the fiscal year ended the 30th June, 1890 :—

Appropriation for maintenance.....	\$16,600 00	
Expenditure do	15,958 45	
	<u> </u>	
Unexpended balance		\$ 641 55
	<u> </u>	
Appropriation for repairs..	\$ 5,600 00	
Expenditure do	5,073 26	526 74
	<u> </u>	<u> </u>
Unexpended balance of both appropriations.....		<u>1,168 29</u>

THREE RIVERS, 4th July, 1890.

APPENDIX No. 8.

REPORT

ON THE

OTTAWA DISTRICT SLIDES AND BOOMS

FOR THE FISCAL YEAR ENDED 30TH JUNE, 1890,

BY

HENRY F. PERLEY, Chief Engineer.

AND

GEORGE P. BROPHY, Superintending Engineer.

APPENDIX No. 8.

SLIDES AND BOOMS—OTTAWA DISTRICT.

Ref. No. 11567.

DEPARTMENT OF PUBLIC WORKS OF CANADA,
CHIEF ENGINEER'S OFFICE,

OTTAWA, 15th September, 1890,

SIR,—Herewith I transmit a report by Mr. G. P. Brophy, Superintending Engineer, Ottawa River Works, on works under his charge, for the fiscal year ended the 30th June, 1890.

I have the honour to be, Sir,

Your obedient servant,

HENRY F. PERLEY,

Chief Engineer.

A. GOBEIL, Esq.,

Secretary, Department Public Works.

OTTAWA RIVER WORKS,
OTTAWA, 15th July, 1890.

SIR,—In accordance with instructions transmitted to me in your letter No. 31021, I have the honour to submit the following report on the works under my charge for the fiscal year ended 30th June last. During the latter portion of the season of 1889, the waters of the Ottawa and tributaries, which had been at a fair pitch for driving operations fell to their normal level, but the quantity of timber that did not reach its destination was comparatively small. The foundations of the works, as soon as accessible, were examined during the autumn months, and preparations made for carrying out the necessary work, which was done, under the heads of Repairs and Reconstruction, as follows:—

REPAIRS ON MAIN STREAM.

Carillon:—The piers, slide and booms were overhauled and strengthened, and where some of the guide booms run partially across the current, steps were taken to straighten them out by placing additional timbers.

Ottawa or South Chaudière Station.—At this place the slides were repaired in their bottom, planking, side piers, bulkheads and aprons; and the storehouses, sheds, and the slide master's dwelling house further improved. The line of bridges over the slide and hydraulic channels was repaired in its flooring plank, as were also the Dufferin, Sappers and Maria street bridges.

At the Hull or North Chaudière Station, certain repairs had to be executed at the slide bottom, the side piers and the outlet bulkheads, while the roadway planking of the bridge over the slide here was renewed. The line of road between the cities of Ottawa and Hull was kept up and maintained. As this is a very busy thoroughfare and narrow, the keeping of the road in order by the use of ordinary macadamizing material is not attended with success. I would therefore repeat a recommendation made by me in a former report to the effect that this roadway be paved with durable material.

Chats Station.—The slide entrance or canal at the head had to be faced with timber to relieve it from damage by the friction of the passing cribs; and as this is a very important work, as viewed from the volume of business done, the tear and wear to be overcome by frequent repairs to the slide bottom, and the side piers and guide-booms involved a considerable outlay.

Cheneax Station.—An immense number of logs are held in the booms at this place, and in order to maintain them in a state of efficiency, and provide for the passage of steamers through the "trip," additional mooring appliances had to be provided.

Portage du Fort Station.—Some plank covering for the guide booms and other minor repairs were carried out here.

Mountain Station.—The booms were repaired in their mooring fastenings, and the bulkhead and slide bottom partially replanked.

Calumet Station.—This is one of the most important places on the Ottawa for the passage of timber, there being a series of three slides and a good deal of friction caused by the passing cribs on account of the fluctuations of the water in the canals or channels forming the slide continuations. The long slide was partially reconstructed last winter and the shorter slides and booms repaired.

Joachim Station.—At this place the slides and dams were repaired, the bottom timbers levelled up and the bulk heads strengthened. The boom piers in basin between upper and lower slides were also repaired and stone filled.

Rocher Capitaine Station.—The slide at this place is the furthest up Government work of that nature on the Ottawa River, and as it is situated near and was designed to overcome a very dangerous rapid, more than usual care has to be taken to have the works efficient and reliable, consequently a thorough overhaul was made of the side piers, the booms and fastenings. Steps were also taken to remove, by blasting, certain dangerous reefs on which the cribs occasionally stuck under variable conditions of water. The work of strengthening the mooring piers above the entrance was also attended to, while the foundations and sheeting plank had defects made good.

REPAIRS ON TRIBUTARIES.

Gatineau River.—The large guide boom near the mouth of this stream on account of the shifting sand banks had to be somewhat changed in position which necessitated a system of boomage to be adopted by the lumbermen, involving the tapping of the main boom through gaps at a greater number of points than formerly. The parting boom in the lake had also to be strengthened by supplying additional chains and timber; while the outlet creek was cleared of bark and rubbish; greater facilities by way of floats furnished at the rafting grounds; and a line of boom, fastened to buoy or anchor attachments, placed at that point. A portion of this river bank nearly opposite the head of the main boom having been battered by passing logs and timber and undermined by the action of the swift current, it became necessary to build a buttress or guard pier filled with stone, to overcome the difficulty and save the travelled road from being washed out.

Madawaska River.—The works on this stream from its mouth to a station above High Falls, fully 30 miles, had by the spring freshets of 1889 and the accompanying ice shoves been (especially where there are isolated dams, piers and booms) very much shaken up; and repairs had to be done almost all along the line. I may mention that many of the dams have been so long in existence that a renewal of them has become necessary. They have been patched so often that further repairing is not practicable.

Coulouge River.—With the exception of renewing some of the slide planking, and repairing dam sheeting and boom chains, nothing further was required on this tributary during the period covered by this report.

Black River.—A portion of the side foundation timbers of the slide near High Falls had to be blocked up, and brought to a proper grade, and as the logs and timber, due to the very steep pitch-off at the outlet, cause great friction and wear, hardwood planking has frequently to be laid here, some strengthening of the booms, piers and their connections was necessary at the point where logs are controlled, a short distance above the head of the slide.

Petewawa River.—On this river, the works have a long range from the mouth to the outlet of Cedar Lake, and mainly consist of booms and piers at the mouth, single-stick slides, with their necessary dams and guide booms, at First, Second and

Third Chutes, Bois dur, Crooked Chute, Lake Traverse, and McDonnell's; together with large retaining dams at Thompson's Rapids and Cedar Lake, and a great number of piers and flat-side dams at points between these stations. As many of these improvements have been built upwards of thirty years, and often repaired, they cannot be depended on for further service. The same remarks that apply to a section of the Madawaska works, in regard to their not having any great strength to withstand the pressure due to the spring floods and the movement of ice, may be considered as having more force when the Petewawa works are spoken of. Last spring, they received very considerable damage and will soon have to be extensively reconstructed. During the winter months, such temporary repairs as could be done, were carried out.

Dumoine River.—The long slide on this tributary, about 3,500 feet in length, required levelling up at places and repairs at the outlet. The stone filling of some of its piers was also topped out and made good, and the planking, where worn, replaced.

WORK OF RECONSTRUCTION.

The only work done under this head, during the fiscal year, was the partial rebuilding of the longest of the three crib-slides at the Calumet Station, on the Ottawa River. As already herein stated, much depends on the Calumet slides, and as the long one was very unsafe, its re-construction had become imperatively necessary. The floods from the southerly tributaries of the Ottawa, passed off without doing much damage to the works on the main river, and the movements of all descriptions of timber, during the month of May, were steady, with the water at a favourable pitch; when the local floods were about exhausted, the north-west waters came down in force but did not attain their full height until about the beginning of June, thus everything points favourably at present to the great bulk of timber and logs reaching their destination in due time and to a comparatively clean "sweep" for 1890.

The following statement compiled from the records in possession of the collector of slide dues in this city, shows the volume of business done at the works, in passing the various descriptions of timber, together with the amount of revenue accrued as tolls, for the fiscal year covered by this report:—

	Pieces.
White pine.....	88,066
Red do	2,435
Flat, Round, Boom and Dimension.....	60,295
Dimension	41,133
Ash.....	819
Birch	82
Tamarac	83
Basswood	69
Elm.....	5
Butternut.....	1
Cedars.....	21,488
Railway ties.....	224,431
Total number of pieces.....	438,907
do do sawlogs.....	4,500,518
Sawn lumber.....	2 cribs.

The revenue accrued on the above was \$96,542.97.

In respectfully submitting the above,

I have the honour to be, Sir,

Your obedient servant,

GEO. P. BROPHY,

Superintending Engineer Ottawa River Works.

HENRY F. PERLEY, Esq.,

Chief Engineer of Public Works, Ottawa.

APPENDIX No. 9.

REPORT

ON THE

NEWCASTLE DISTRICT SLIDES AND BOOMS

BY

HENRY F. PERLEY, CHIEF ENGINEER,

AND

R. B. ROGERS, SUPERINTENDING ENGINEER.

APPENDIX No. 9.

SLIDES AND BOOMS—NEWCASTLE DISTRICT.

Ref. No. 111566.

DEPARTMENT OF PUBLIC WORKS OF CANADA,
CHIEF ENGINEER'S OFFICE,
OTTAWA, 18th September, 1890.

SIR,—Herewith I transmit a report by Mr. R. B. Rogers, Superintending Engineer of the River Trent and Newcastle District Works, on the works under his charge, for the fiscal year ended 30th June, 1890.

I have the honour to be, Sir,

Your obedient servant,

HENRY F. PERLEY,
Chief Engineer.

A. GOREIL, Esq.,
Secretary, Public Works Department.

ENGINEER'S OFFICE,
PETERBOROUGH, 12th July, 1890.

SIR,—I have the honour to submit the following report on the works under my charge, connected with the Department of Public Works, for the fiscal year ended 30th June, 1890.

The works in the district under my supervision are constructed for two purposes, viz.: those erected for the improvement of navigation, and these erected to facilitate the descent of timber. The former of these are under the control of the Department of Railways and Canals, the latter are under the control of the Department of Public Works. The works are situated on the chain of waters extending from Trenton to Balsam Lake, a distance of about 165 miles.

Besides the storage of water for the benefit of navigation, and the driving of timber, there are large manufacturing interests dependent upon an even flow of water, so that constant care is required in its regulation from early spring, when the freshets take place, until it freezes up. During the past spring we had two unusual freshets, one occurring in June, the other in January, when the water raised to spring height. These were caused by heavy rains, and caused considerable anxiety while they lasted. There was a good flow of water during the whole season, though the latter part of the season was very dry. If it had not been that I had held an extra supply of water in Clear and Stoney and Buckhorn Lakes many of the manufactories and the navigation of the Otonabee River would have had to stop for a month or more after the beginning of October.

The works suffered no damage further than the ordinary wear and tear. The general works at the different stations, together with the repairs executed, are as follows:—

FENELON FALLS.

The works here consist of a dam, locks, slide and booms. The last two are under the charge of this Department. None but minor repairs were done.

BOBCAYGEON.

The works here are a stop log dam, locks and booms. The timber descends by the southern channel, known as "Little Bob" channel, on which is placed the timber slide.

BUCKHORN.

There is here a flat dam, 180 feet long, three sluices and a timber slide, besides a lock and booms. The timber slide and booms are under this Department. There were no repairs made to them.

LOVESICK.

The works here consist of four stop log dams, with timber slide and booms, and single-lift lock, all these were recently constructed by the Department of Railways and Canals.

BURLEIGH.

There is here a dam, slide, booms and double-lift lock, these were recently constructed by the Department of Railways and Canals, and are under their control.

YOUNG'S POINT.

There is here a lock under the control of the Ontario Government, a dam and booms built by the Department of Railways and Canals. A line of booms commence at the end of Clear Lake and runs to this station, a distance of about 800 feet. This boom is for the purpose of dividing the timber and the navigation channels. Two of the piers were raised by the addition of four new courses.

KATCHEWANNOE LAKE.

A line of single-stick booms, held in position by means of piers and booms, extends from Young's Point to the "Three Islands" in this lake, a distance of about three and a half miles. This boom protects the navigation channel from the sawlogs, and is greatly appreciated by the public and those interested in navigation. Some of the anchor chains were cut by the lumbermen, and the boom allowed to drift out of position. The boom was replaced and few new piers (13 by 13 by 13 feet) were built and a number of new anchors were supplied. Some stringent means must be taken to make the lumbermen have some respect for navigation interests, as every year this boom is displaced or cut.

PETERBORO.'

There is in the lake a three-stick boom, about 1,600 feet long with three piers. Some of the boom chains were renewed. Below this is a lock, dam and timber slide. There were no repairs.

HASTINGS.

The works here consist of a dam, lock, timber slide and booms. The slide and booms are under the control of this Department. The apron of the slide was repaired and some new stop logs supplied. At Heely's Falls, Middle Falls and Chisholm's there are timber slides and booms, but these have been placed under the charge of Messrs. Rathbun and Gilmour to keep in repair, in consideration of the tolls on timber having been taken off.

I have the honour to be, Sir,

Your obedient servant,

RICHARD B. ROGERS,

Superintending Engineer.

HENRY F. PERLEY, Esq.,

Chief Engineer, Public Works Department,

Ottawa.

STATEMENT showing the number of pieces of Timber, &c., which passed over the different slides on the River Trent and Newcastle District Works, during fiscal year ended 30th June, 1890.

Station.	Sawlogs.	Cedar, 16 ft.	Cedar, 8 ft.	Railway Ties.	Boom Timber.	Square Timber.	Bolts.
Fenelon Falls.....	218,000		2,000		2,500		
Buckhorn.....	50,000				600		
Burleigh.....	258,000				3,900		
Young's Point.....	255,000				3,800		
Lakefield.....	244,000				3,500		
Peterborough.....	244,000				3,500		
Hastings.....	75,200				1,000		
Heely's Falls.....	93,505	8,832	4,165	162	2,107	78	
Middle Falls.....	325,246	125,625	56,956	2,913	2,607	333	12,660
Chisbolm's Rapid.....	325,246	125,625	56,956	2,913	2,607	333	12,660

PETERBORO', 15th July, 1890.

RICHARD B. ROGERS,
Superintending Engineer.

APPENDIX No. 10.

- STATEMENT OF STAFF EMPLOYED

ON THE

SLIDES AND BOOMS

THROUGHOUT THE DOMINION.

APPENDIX No. 10.

Ref. No. 111.576.

STATEMENT showing Names, Dates of Appointment, Salaries, &c., of persons employed on the different Slides and Booms, on 30th June, 1890.

Name.	Date of Birth.	Position.	Where Employed.	Date of Appointment to Public Works Department.	Salary.	Remarks.
<i>Collector of Slide and Boom Dues.</i>						
E. T. Smith	Nov. 26, 1846	Collector	Ottawa	July 12, 1889	\$ cts. 1,200 00 per annum.	Date of first appointment to Crown Timber Office, Ottawa, 23rd June, 1864. Clerk Department of Inland Revenue, 1st July, 1870, to 30th June, 1889.
James Slater	April 30, 1847	Assistant Collector ..	do	Nov. 14, 1889	850 00 do	Date of first appointment to Crown Timber Office, Ottawa, 21st April, 1877. Clerk Department of Inland Revenue, 1st April, 1883, to 30th June, 1889.
James Steen	June 17, 1830	Eastman	do	July 12, 1889	60 00 per month..	Employed during the season of navigation for 6 months each year. Date of first appointment, 26th May, 1861. Timber Counter, Ottawa, for Department of Inland Revenue, 7th January, 1884, to 30th June, 1889.
John Redmond	August 2, 1823	do	do ..	July 12, 1889	60 00 do	Employed during the season of navigation only, for 6 months each year. Date of first appointment, 1st May, 1872. Assistant Timber Counter, Ottawa, for Department of Inland Revenue, 7th January, 1884, to 30th June, 1889.
Sévére Dumoulin	Feb. 4, 1829	Collector	Three Rivers	July 12, 1889	200 00 per annum.	Date of first appointment to Department of Inland Revenue, 3rd May, 1886.
<i>Saguenay District.</i>						
Arthur Boulanger	Sept. 11, 1854	Superintendent	Saguenay	May 19, 1881	475 00 per annum.	<i>Saguenay Works</i> —In addition to the Superintendent, there are employed on the Saguenay works 4 flagmen, at 70 cents per day each during the passing of the logs through the slides, which lasts one or two months.
Joseph Boulanger .....	.....	Asst. Superintendent	do	Oct. 1, 1880	30 00 per month..	

APPENDIX No. 19. SEAWARERS showing the Name, &c., of persons employed on the different Bibles and Booms—Concluded.

Name	Date of Birth.	Position	Where Employed	Date of Appointment	Salary.	Remarks.
A. B. Simmons	Nov. 26, 1862	Boat Swain	Wanda Channel	1865	2 50 per day	Paid during season of navigation, 7 months. Attends to repairs in winter.
C. A. Simmons	Nov. 10, 1863	do.	do.	1872	1 75 do.	Paid during season of navigation, 7 months. Attends to repairs in winter.
<i>Boatmen Detail</i>						
J. B. Briggs	Jan. 11, 1870	Boat Swain	Peterson	July 1, 1884	400 00 per annum	Receives also \$200 per annum from Department of Railways and Canals.
C. B. Briggs	do.	do.	do.	do.	do.	Receives also \$200 per annum from Department of Railways and Canals.
C. B. Briggs	do.	Boat Swain	Charlesburg Rapids.	April 1, 1883	200 00 do.	
C. B. Briggs	do.	do.	Charlesburg Falls	do.	200 00 do.	
C. B. Briggs	do.	do.	Blackburn	May 1, 1879	100 00 do.	
C. B. Briggs	do.	do.	Frederick Falls	July 1, 1878	200 00 do.	Receives also \$150 per annum from Department of Railways and Canals.
<i>Washington Channel</i>						
J. B. Briggs	April 1, 1882	Boat Swain	Washington	April 12, 1887	400 00 do.	
C. B. Briggs	do.	do.	do.	do.	30 00 per month.	
<i>Vancouver Lock</i>						
A. Briggs	do.	Lock Keeper	Vancouver	Sept. 1, 1885	1 25 per day	
C. Briggs	do.	do.	do.	do.	1 25 do.	
<i>King's Landing Dock, British Columbia.</i>						
John Davenport	Sept. 17, 1887	Dock Master	Esquimalt	Sept. 17, 1887	100 00 per month.	
C. Muir	April 1, 1887	Engineer	do.	April 1, 1887	100 00 do.	
A. D. Croves	Dec. 1, 1887	Carpenter	do.	Dec. 1, 1887	80 00 do.	

<i>Levia Granting Dock.</i>				\$	cts.
E. F. Bernier	Dock Master	Levia	June	1, 1888	1,200 00 per annum
Wm. Macdonald	Engineer	do	do	1, 1888	600 00 do
Narcisse Lemelin	Fireman	do	do	1, 1888	25 00 per month
Napoleon Lemelin	do	do	do	1, 1888	25 00 do
Jas. Woods	Clerk	do	do	1, 1888	50 00 per annum
A. H. Verret	Secretary-Treasurer	do	do	1, 1888	200 00 do

R. STECKEL.



APPENDIX No. 11.

STATEMENT

OF

SLIDE AND BOOM DUES
OTTAWA DISTRICT.

EDWARD T. SMITH, Collector.

APPENDIX No. 11.

Ref. No. 111,688.

SLIDES AND BOOMS—OTTAWA DISTRICT.

COLLECTOR'S OFFICE,

OTTAWA, 23rd September, 1890.

SIR,—Since by the Act passed during the Session of 1889, 52 V., c. 19, the collection of slide and boom dues was transferred to this Department, it seems proper to give a short history of this branch of the service.

River Ottawa.

The first record we have of any charge for the use of works constructed by the Government for facilitating the safe passage of timber down the River Ottawa dates from the year 1845, during which the revenue amounted to £1,140. 0s. 4d., or \$4,560.07, derived from the charges on timber passing the slides at the Calumet—the Mountain and the Chats on the Ottawa River, and at High Falls on the River Madawaska.

In 1846 the Government having acquired the slides at the Chaudière, the toll for their use was first collected, and it was in this year that I find dues on saw-logs were first collected, the quantity being 200 pieces.

From 1845 to 1854, inclusive, the revenue from slides was collected by the Collector of Customs.

In 1855 the collection of slide dues was transferred to the Department of Crown Lands, and a collector appointed who was stationed in the Crown Timber Office, Ottawa, the revenue having in the meantime grown from \$4,560.07 in 1845, to \$28,450 in 1855, and the number of saw-logs paying slidage from 200 pieces in 1846, to 123,140 pieces in 1855.

It appears that from the first it was the authorized custom to take bonds to secure the payment of slidage on square timber, these bonds being transmitted to the Collector of Timber Dues at Quebec, who accounted directly to the Receiver General and the Crown Lands Departments, respectively, for the moneys collected by him. The object of these bonds, I believe was twofold; first, to obtain an unquestionable acknowledgment of the account secured by the bond of one or two solvent parties, and, secondly, as the regulations required the dues to be paid or secured before leaving Ottawa (then Bytown), giving bonds enabled the lumberman to proceed with his timber to Quebec, where he could realize on it and pay his dues instead of being compelled to raise the money here at perhaps a ruinous rate of interest.

This arrangement continued up to 1st June, 1864, when the collection of slide dues was combined with the collection of the other revenues from timber on the Ottawa.

In this year the system of taking bonds, instituted in 1845, was discarded, and instead, the amount of the slidage was endorsed on the clearance for each raft, which endorsement was usually signed by the owner or party in charge of the timber, thus making it with the other Crown dues a first charge on the timber.

The revenue had in the meantime increased from \$28,450 in 1855 to the sum of \$70,064.52 in 1864, the number of saw-logs being 514,316 against 123,140 pieces in 1855.

In 1867 came Confederation, and slide and boom dues having ceased to be Provincial revenues were transferred to the Department of Inland Revenue, and as the Crown Timber Office, Ottawa, dealt with timber cut on the north side of the Ottawa from the mouth of and including the River Gatineau to the source of the former, and on the south side from the County of Carleton to the head of Lake Temiscamingue, and the sources of the streams tributary to the Ottawa from the Ontario side, after long correspondence it was finally decided in 1868 that as the same timber, and the same proprietors would have to be dealt with, it would be conducive to the satisfactory collection of the Dominion and Provincial revenues to continue the Crown Timber Office as a Dominion office, which would also collect the Provincial revenues, and account for them to the respective Governments of Ontario and Quebec, all three Governments paying an equal share of the cost of the office, which arrangement remained in force till 1st July, 1889.

In 1875 the system of taking bonds was resumed and continued until 1889, but in a few instances the amounts of slidge on several rafts of timber belonging to the same party were allowed to accumulate and were collected at the close of the season in cases where the parties were of undoubtedly sound financial standing.

In July, 1889, the collection of slide and boom dues was assumed by the Department of Public Works, the revenue was \$96,542.97 and the quantity of saw-logs which passed through the works was 4,500,518 pieces.

The revenue, as stated above, includes the revenue from tolls for the use of works on the tributaries of the Ottawa as hereinafter described.

River Gatineau—Province of Quebec.

Ascending the Ottawa River, the River Gatineau, which falls into the Ottawa about two miles below the city of Ottawa, is the first tributary on which we find works yielding revenue.

The works consist of a large guide boom which directs the timber and saw-logs from the strong current at the mouth into a safety pond of about 72 acres in extent, where the timber passes through a creek to the rafting ground.

These works were commenced in 1848, in which year the revenue was \$835.78; in 1855, \$1,125.82; in 1864, \$4,980.18; and in 1889, \$11,264.23.

River Madawaska—Province of Ontario.

About 40 miles above Ottawa on the Ontario side, this tributary falls into the River Ottawa, has extensive improvements upon it constructed by the Government, which, I understand, were begun in 1843-44, and re-constructed in 1845-46, and extended and improved in 1854, and again in 1884.

The revenue from the Madawaska works has been for the years mentioned as follows, viz.:—In 1845, \$52.87; in 1855, \$3,260.75; in 1864, \$9,867.85; and in 1889, \$28,427.15.

River Coulonge—Province of Quebec.

This river joins the River Ottawa about 48 miles above the mouth of the Madawaska.

The slide on this river was constructed in 1865. The revenue from these works has been in 1865, \$1,171; in 1889, \$3,616.30.

Black River—Province of Quebec.

About nine miles above the Coulonge the Black River falls into the Ottawa. The works on this river were originally constructed by private parties, but in 1867 the Government purchased them at a cost of \$12,500; in 1870-71 the slide was renewed.

The revenue from these works has been for 1867, \$1,741.30, and in 1889, \$3,613.90.

River Petewawa.

This river flows from the south into the Ottawa at 112 miles above the city of Ottawa. The improvements, which were commenced in 1857 and gradually extended from time to time since, are more numerous, and the cost vastly greater than the works on any other tributary of the Ottawa, owing to the short intervals at which rapids, swift currents and chutes are encountered.

The tolls on timber passing through all the works on this river are the highest to be found in the tariff; they amounted to \$1,260 in 1858, \$5,006.25 in 1864, and \$17,763.36 in 1889.

River Dumoine.

Which enters the Ottawa from the north at about 150 miles above this city, is the last tributary ascending the Ottawa with Government improvements yielding tolls.

The first slide and booms were constructed by a joint stock company incorporated in 1851, under the name of the Rivière Dumoine Boom and Slide Company.

In 1862-63 the Government enlarged and improved the works, and in 1871-72 built a new slide at High Falls of a greater length than any that had been constructed as a public work in the Ottawa Valley, viz.: 3,384 feet; this new slide is used only for the passage of square timber.

The revenue from this river was in 1865, \$757.75, and in 1889, \$966.00.

For a full description of the various works on the River Ottawa and its tributaries I would respectfully refer to the tabular statement on page 688 of the General Report, Public Works, 1867-1882.

Annexed hereto are statements showing the dues accrued on each of the Government slides and works on the Ottawa, and the quantities of timber and saw-logs that passed through said works during the year ending 30th June, 1890.

The revenue for slidage and boomage for the year ending 30th June, 1890, was.....	\$ 96,542 07
Of which there has been collected.....	\$84,889 11
Written off by Order in Council	221 02
Ordinary dues uncollected 1st July, 1890	4,529 79
Chaudière boomage in suspense.....	6,903 05
	<u>96,542 97</u>

There was also collected of dues outstanding on 30th June, 1889.....

	\$ 17,526 56
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Making the gross collections for the year..... \$102,415 67

I have the honour to be, Sir,

Your obedient Servant,

EDWARD T. SMITH,

Collector of Slide and Boom Dues.

A. GORRIL, Esq.,
Secretary Department Public Works,
Ottawa.

STATEMENT showing the Dues accrued on each of the undermentioned Government Slides and Works on the River Ottawa and its tributaries, during the fiscal year ending 30th June, 1890.

Name of River.	Name of Slide or other Improvement.	Amount accrued on each Slide.	Amount accrued on each River.
		\$ cts.	\$ cts.
River Ottawa.....	Rocher Capitaine Slide.....	233 00	
	Des Joachim do.....	1,233 00	
	Calumet do.....	2,035 75	
	Portage du Fort do.....	676 25	
	Chats do.....	2,325 00	
	Chaudière do.....	6,144 04	
	Chenaux Boom.....	10,036 51	
	Chaudière do.....	6,903 05	
			29,586 60
Petewawa.....	Cedar Lake to Memo Rapids.....	900 98	
	New Slide near Lake Traverse.....	2,737 07	
	Lake Traverse, Trout Lake.....	2,714 42	
	Crooked Chute Slide.....	2,939 47	
	Bois Dur to River Ottawa.....	8,471 42	
			17,763 36
Madawaska.....	Ragged Chute and High Falls Slide and improvements.....	18,733 19	
	Improvements below High Falls to Arnprior.....	3,706 33	
	Slide at Arnprior.....	1,803 14	
	Boom at Mouth.....	4,184 49	
			28,427 15
River Coulonge.....	Coulonge River Slide.....		3,616 30
Black River.....	Black River do.....		3,613 90
Dumoine.....	High Falls do.....	878 25	
	Below High Falls.....	87 75	
			966 00
River Gatineau.....	Gatineau Boom.....		11,264 23
			95,237 54

EDWARD T. SMITH,
Collector of Slide and Boom Dues.

STATEMENT of the number of pieces of timber, saw-logs, &c., that passed through the Government Slides and Works on the River Ottawa and its tributaries, during the fiscal year ended 30th June, 1890 :—

White pine timber.....	88,066	pieces.
Red.....	2,435	"
Flat, round, boom and dimension.....	60,295	"
Dimension.....	41,133	"
Ash.....	819	"
Birch.....	82	"
Tamarac.....	83	"
Basswood.....	69	"
Elm.....	5	"
Butternut	1	"
Cedars.....	21,488	"
Railway ties.....	224,431	"
	438,907	
Saw-logs.....	4,500,518	
Sawn lumber.....	2	cribs.

The revenue accrued on the above was \$95,458.56.

EDWARD T. SMITH,

Collector of Slide and Boom Dues.

STATEMENT of Slideage and Boomage from Ottawa Slides and Works, outstanding 30th June, 1889, and remaining uncollected 1st September, 1890.

By whom due.	Bad and doubtful debts.	*Chaudière Boomage in suspense.	Other Slide and Boom dues due.	Ordinary Slide and Boom dues.	Total dues outstanding 1st Sept., 1890.	Year to which dues belong.	Remarks.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.		
John & Wm. McLean.....	53 14				53 14 1873.....	Insolvent.	
James Yull.....	9 25				9 25 1876.....	Overcharge.	
John Rowan.....	342 50				342 50 1872 and 1873.....	Insolvent.	
Lenieux & Charette.....	21 30				21 30 1873.....	do	
Tailion & LaPierre.....	148 10				148 10 1873 and 1874.....	do	
Musgrove & McHarry.....	261 42				261 42 1873 and 1874.....	do	
W. C. Wells.....	690 90				690 90 1873 and 1874.....	do	
Dufresne & McGarity.....	528 80				528 80 1874 and 1875.....	do	
Walton Smith.....	171 46				171 46 1871 and 1875.....	do	
A. H. Baldwin.....	3,597 32				3,597 32 1871 to 1874.....	do	
Hon. James Skead.....	9,807 65				9,807 65 1867 1863, 1864, 1869, 1875 to 1878.....	do	
Batson & Currier.....	5,558 70				5,558 70 1875 to 1877.....	do	
A. F. A. Knight.....	546 80				546 30 1878.....	do	
James Walker.....	11 25				11 25 1877.....	do	
R. Campbell & Son.....	1,558 50				1,558 50 1879 to 1881.....	do	
John R. Booth.....	* 9,871 93		398 88		10,270 81 1881 to 1889.....	do	\$398 88 counter claim, damage by breaking of Coulonge Boom.
Perley & Pattee.....	* 8,889 85		2,455 66		11,344 91 1867, 1868, 1880 to 1888.....	do	\$2,035 96 counter claim, damage by Madawaska Boom breaking; also, \$419.10 counter claim, damage by breaking of Coulonge Boom.
The Brinson & Weston Lumber Co.....		* 8,180 79			8,180 79 1881 to 1885.....	do	
Pierce & Co.....		* 462 18			462 18 1888.....	do	
G. A. Grier & Co.....		* 1,060 59			1,060 59 1880 and 1887.....	do	
Estate late Levi Young.....		* 1,461 20			1,461 20 1881 to 1885.....	do	
W. Mason.....		* 413 85			413 85 1881 to 1889.....	do	* Chaudière Boomage.—These parties claim that they have maintained these works wholly at their own expense since 1881.
Gilmour & Co.....		* 406 27			406 27 1884.....	do	Overcharge.
John Rochester.....		* 258 88			258 88 1881 to 1883.....	do	do
J. & B. Grier.....	76 84				76 84 1883.....	do	do
R. & W. Courcy.....	95 42				95 42 1882 and 1883.....	do	do
A. & P. White.....	101 00				101 00 1881.....	do	do reported in return S. 38, for March, 1886.

STATEMENT of Slidage and Boomage from Ottawa Slides and Works outstanding uncollected at Ottawa, 30th June, 1890,
remaining uncollected, 1st September, 1890.

DUES OF 1889-90.

By Whom Due.	Chaudiere Boomage in Suspense.	Ordinary Slide and Boom Dues.	Total Dues Outstanding 1st Sept., 1890.	Remarks.
	\$ cts.	\$ cts.	\$ cts.	
John R. Beath	2,561 69		2,561 69	<p><i>Chaudiere Boomage.</i></p> <p>The Government expended the sum of \$7,000 in the construction of this work in 1886. No tolls were charged till 1890, at which time the mill-owners claimed that the original works had become useless. Since then the Government has expended no money either for repairs, maintenance or operation, all of which were paid for by the mill-owners. In 1880 they refunded the Government \$7,000 as a settlement of the claim for tolls. Since and including the year 1881, it is claimed that the works have been exclusively operated and maintained by the mill men. The matter is being investigated with a view to a final decision as to the \$6,903.05 herein stated, as well as the \$51,005.54 returned as accrued previous to 1st July, 1889.</p>
Perley & Patton	1,203 26		1,203 26	
The Bronsons & Weston Lumber Company	2,056 96		2,056 96	
Pierce & Co.	913 48		913 48	
William Mason & Sons	167 66	315 83	483 49	
N. E. Cormier		462 07	462 07	
R. Hurdman & Co.		3,476 89	3,476 89	
Total.	6,903 65	4,254 79	11,157 84	

RECAPITULATION.

Chaudiere Boomage in suspense	\$ 6,903 65
Ordinary slide and boom dues	4,254 79
Total	\$11,157 84

EDWARD T. SMITH,

Collector of Slide and Boom Dues.

OTTAWA, 23rd September, 1890.

APPENDIX No. 12.

REPORT

ON

GOVERNMENT TELEGRAPH LINES,

FOR THE FISCAL YEAR ENDED 30TH JUNE, 1890,

BY

F. N. GISBORNE, Superintendent.

APPENDIX No. 12.

REPORT ON GOVERNMENT TELEGRAPH LINES.

Ref. No. 111,542.

DEPARTMENT OF PUBLIC WORKS,
OTTAWA, 15th September, 1890.

SIR,—I have the honour to submit the following report upon the Telegraph Service for the twelve months ended 30th June, 1890, with tabular statements of lines, operating staff, etc., established in the several districts.

I have the honour to be, Sir,

Your obedient servant,

F. N. GISBORNE,

General Superintendent Government Telegraph Service.

A. GOBEL, Esq.,
Secretary, Public Works.

TELEGRAPH SERVICE—1889-90.

NEWFOUNDLAND.

The line between Cape Ray and Port au Basque has been operated and maintained at a cost of \$250, under an agreement entered into with the Anglo-American Telegraph Company.

MARITIME PROVINCES.

The several systems in the Maritime Provinces have been satisfactorily maintained under established arrangements.

The Meat Cove line, Cape Breton, has remained in good working order throughout the year. The construction of a projected loop line to White Point, for which a vote of \$600 was obtained during the Session of 1889-90, remains in abeyance, pending an additional vote of \$300, found to be required, the length and cost of the line being in excess of the estimate submitted.

The Grand Manan-Campobello Cable in the Bay of Fundy ceased working on the 2nd May, 1889, and was repaired on 1st November by Capt. Guilford, of the SS. "Newfield," who reported it to be in very bad condition, 7 splices being necessary to restore communication. On the 3rd May, 1890, it again ceased working, and arrangements have been made to replace damaged sections with new cable during the present season.

In the month of November, 1889, the S.S. "Newfield" was also engaged in laying the cables granted to the Nova Scotia Telephone Company to complete the connection of Brier and Long Islands with the town of Digby, N.S.

The lengths laid, on the 4th and 6th November, respectively, were from Brier Island to Long Island about $\frac{1}{2}$ knot, and from Long Island to Digby Neck about $\frac{1}{2}$ knot—in all, $1\frac{1}{2}$ knots. The telephone company maintains the connection without further cost to the Government.

The revenue and expenditure in connection with the several lines in the Maritime Provinces was as follows:—

—	Period inclusive.	Revenue.	Expenditure.
		\$	\$
Escuminac line.....	May, 1889—April, 1890..	106 31	432 89
Meat Cove line.....	June, 1889— do 1890..	984 43	1,718 19
Cape Sable line.....	do 1889— do 1890..	49 73	312 04
Bay of Fundy line.....	July, 1889—May, 1890..	360 55	1,023 99
Cheticamp line.....	June, 1889—April, 1890..	204 44	868 51

RIVER AND GULF OF ST. LAWRENCE.

The heavy cables connecting Gross Isle Quarantine Station with Orleans Island withstood the action of running ice last spring, and uninterrupted communication was maintained with Quebec throughout the entire year.

At the Magdalen Islands a-half knot of new cable was laid in the month of June between Grindstone and Allright Islands, thus re-connecting the House Harbour Office, which had been for some months cut off in consequence of damage to the old cable in the channel.

The Bird Rock cable was again interrupted on the 3rd December, 1889, and in consequence of a report submitted to the Department (see copy herewith—Appendix A) an Order-in-Council was issued directing the abandonment of the line in favour of a connection to be made by cable between Meat Cove Station and St. Paul's Island, distant about 19 miles.

In accordance with this decision, the S.S. "Newfield" is now proceeding with the work, an appropriation of \$3,000 having been obtained for the extra cable and cost of land line connections.

On the north shore of the St. Lawrence the line has been completed to Point aux Esquimaux, distant 586 miles from Quebec, and an office was opened at that place on the 10th October, 1889. During the present summer the most obstructive rivers will be bridged, and shelter huts for line repairers and mail carriers will be built at points from 15 to 20 miles apart.

A cable connecting Mingan, on the north shore, with Anticosti Island, will also be laid during the present season.

The Gaspé-Anticosti and other Gulf cables and land lines have been working satisfactorily during the year.

The revenue and expenditure figures are as follows:—

—	Period inclusive.	Revenue.	Expenditure.
		\$	\$
Anticosti lines.....	May, 1889—Jan., 1890..	202 11	1,879 08
Magdalen Islands lines.....	Mar., 1889—Mar., 1890..	681 71	2,249 59
North Shore St. Lawrence (W. B.).....	June, 1889—April, 1890..	2,062 15	3,407 09
" " (E. B.).....	The several offices.....	504 88	5,000 89
Quarantine Line.....	May, 1889—April, 1890..	326 94	1,039 16

ONTARIO.

The Bath-Amherst Island line, and the Kingston-Wolf Island line, have been satisfactorily worked since their transfer at a nominal rental to the North American Telephone Company.

The Pelee Island, Lake Erie, telephone line has also worked satisfactorily, and the accommodation is very highly prized by the insular inhabitants.

The revenue and expenditure figures are as follows:—

—	Period inclusive.	Revenue.	Expenditure.
		\$	\$
Pelee Island Line.....	June, 1889—Jan., 1890...	119 01	89 56

NORTH-WEST TERRITORY.

The Qu'Appelle-Edmonton line, *via* Battleford, has worked in a satisfactory manner throughout the year. The revenue was \$6,379.36, and the expenditure \$23,036.57.

In consequence of the early completion of the Regina to Prince Albert railway and telegraph, notice has been given as to the early abandonment of the present Saskatoon-Clark's Crossing and Prince Albert Line.

BRITISH COLUMBIA.

A line from Victoria to Cape Beale, about 115 miles, has been nearly completed, with way stations at Otter Point, San Juan and Bonilla Point, and will be worked under the management of the Resident Engineer, Mr. F. C. Gamble.

The re-poling of the line between Ashcroft and Barkerville, 273 miles, is now being proceeded with. This line continues to be operated by the Canadian Pacific Railway in conjunction with its telegraph system. The total excess of expenditure over revenue from 1st July, 1889, to 31st March, 1890, was \$3,114.60.

RECAPITULATION.

—	Revenue.	Expenditure.	Remarks.
	\$ cts.	\$ cts.	
Gulf of St. Lawrence and Maritime Provinces:—			
Anticosti lines.....	202 11	1,879 08	Signal Service and Meteorological Service messages transmitted free of charge
Magdalen Islands lines.....	681 71	1,249 59	
Ment Cove line.....	984 43	1,718 19	
Cape Sable ".....	49 73	312 04	
Esquimaux ".....	106 31	432 89	
Cheticamp ".....	204 44	868 51	
Bay of Fundy line.....	360 55	1,023 99	
Quarantine ".....	326 94	1,039 16	
North Shore St. Lawrence (W.B.).....	2,062 15	3,407 09	
" (E.B.).....	504 88	5,000 89	
Cape Ray, Newfoundland, line.....		250 00	
Subsidies, stationery, line and office material, cable repairs and contingencies chargeable to the appropriation for Gulf lines.....		8,062 15	
Ontario-Pelee Island line.....	119 01	26,243 58	
North-West Telegraph lines.....	6,379 36	23,036 57	
Total.....	11,981 62	49,369 71	

F. N. GISBORNE,

Genl. Supt. Government Telegraph Service.

OTTAWA, 15th September, 1890.

GOVERNMENT TELEGRAPH SERVICE.

NEWFOUNDLAND TELEGRAPH SYSTEM.

STATIONS.	Intermediate Distances.	Operators.	Salaries per Annum.	Date of Appointment.	Memo.
	Miles.		\$ cts.		
1 Port au Basque.....	0	.....	50 00 or con'n ..	.....	N.B.—The commission is 25 per cent. upon all business to and from the office; said commission guaranteed not to be less than at the rate of \$50 per annum.
2 Cape Ray Lighthouse.....	14	.....	50 00 do ..	.....
Totals.....	14	.....	100 00	.....
Cost of land line, \$1,763.36; interest thereon at 5 per cent., say.....					\$ 90 00
Estimated annual maintenance and repairs.....					160 00
Total					\$250 00 Required in Estimates, 1890-91.

N.B.—The above short line is constructed in connection with the Signal Service, and connects at Port au Basque with the land line system of the Anglo-American Telegraph Company.

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Station.	Intermediate Locations.	Engineer.	\$ cts.	Salary per Annum.	Days of Appoint-ment.	Month.
* Fox Bay	Miles. 0	J. Stubbart	50 00 or com'n	Nov. 1, 1888	N. H.	The commission is 25 per cent, upon all busi- ness to and from the office; and commission guaranteed not to be less than at the rate of \$20 per annum.
Heath Point Light-house.						
3 North Point Light-house.	23	T. Cagney	50 00	do	July 20, 1881	
4 North Point Light-house.	22 1/2	A. Nadeau.	50 00	do	Oct. 1, 1888	
5 North Point Light-house.	17 1/2	R. Bradley	50 00	do	July 7, 1881	
6 Salt Lake	52	F. Demaree.	300 00	do	Oct. 19, 1881	General Repairer. Plus \$1 per day when absent on duty.
7 North West Point Light-house	15	Miss G. Pope	200 00	do	Oct. 18, 1880	Chief Operator since 1st August, 1882.
8 North West Point Light-house	15	E. Pope.	100 00	do	Aug. 1, 1882	District Superintendent. Plus \$1 per day when absent on duty.
9 North West Point Light-house	15 1/2		50 00	do		
10 North West Point Light-house	22	M. Dugway	50 00	do	Oct. 1, 1886	
11 West Point Light-house	14	A. Malum.	50 00	do	Aug. 1, 1881	Note. A special allowance for maintenance of office, \$20 per annum has been added to the commis- sion for officers marked*, since September, 1887.
12 West Point Light-house	3	F. Calad	50 00	do	July 1, 1882	
Total	211		1150 00			

ANTICOSTI TELEGRAPH SYSTEM.

GASPÉ.

No.	STATIONS.	Intermediate Distances.	Operators.	Salaries per Annum.	Date of Appointment.	MEMO.
1	L'Anse à Fougère.....	Miles.		\$ cts. 50 00 or com'n..		N.B.—The commission is 25 per cent. on all business to and from the office; said commission guaranteed not to be less than at the rate of \$50 per annum.
2	Gaspé Basin.....	28	J. J. Annett.....	150 00	Oct. 16, 1881..	
		28		200 00		

ESTIMATED COST OF ANNUAL MAINTENANCE OF ANTICOSTI SYSTEM.

Land lines—Salaries and repairs	\$3,000 00
Cables—Repairs, say.	1,000 00
Total	\$4,000 00
Less—Revenue, probably.....	500 00
Balance deficit.....	\$3,500 00

Required in Estimates, 1890-91.

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MAGDALEN ISLANDS TELEGRAPH SYSTEM. MAGDALEN ISLANDS SECTION

STATIONS.	Inter- mediate Distances.	Operators.	Salaries per Annum.	Date of Appointment.	Memo.
	Miles.		\$ cts.		
1 Ankerst	0	Miss J. Shaw	50 00 or com'n. Oct.	1, 1882. N. R.	The commission is 25 per cent. on all business to and from the office; said commission guaranteed not to be less than at the rate of \$50 per annum.
2 Amherst Light-house	9	Wm. Cormier	50 00 do	June 11, 1881.	
3 Etang du Nord Village	15	P. Pelletier	40 00 do	Dec. 1, 1881.	Plus \$20 per annum for rent. General line repairer
4 do Light-house	1	T. O'Brien	50 00 do	do 1, 1881.	2 wire loop.
5 Cap aux Meules		W. Leslie	50 00 do	Aug. 9, 1883.	
6 House Harbour	8	A. Lehoucqas, D. Supt.,	50 00 do	do 17, 1880.	Plus \$1 per day when absent on duty.
7 Wolfe Island.	24	P. Lehoucqas	50 00	June 1, 1888.	
8 Green Island.	11	N. Clark	200 00	June 1, 1888.	
9 Grand Entry	11	Miss McPhail	50 00	Feb. 18, 1882.	
Totals	84		1,400 00		

MAGDALEN ISLANDS TELEGRAPH SYSTEM.
CAPE BRETON SECTION.

No.	STATIONS.	Intermediate Distances.	Operators.	Salaries per Annum.	Date of Appointment.	Memo.
		Miles.		\$ cts.		
1	Meat Cove (Cable Station).	0	A. B. McDonald.	420 00	Nov. 7, 1880	N.B.—The commission is 25 p. c. upon all business to and from the office; said commission guaranteed not to be less than at the rate of \$50 per annum.
2	Aspy Bay.	10½	R. G. Zwicker.	50 00 or com'n.	Aug. 1, 1882	
3	Neil's Harbour (Loop Line).	15	M. McLeod.	50 00 do	April 1, 1887	
4	Ingonish, North Bay.	9	J. M. Burke.	360 00	do do	1, 1882 General repairer.
5	South Ingonish.	10½	Miss A. A. Baker.	50 00 do	July 1, 1880	
6	French River.	23	John McDonald.	50 00 do	April 1, 1880	
7	St. Ann's, South Bay.	19	Miss C. Morrison.	50 00 do	do do	1, 1884 N.B.—This section is at present operated and maintained by the Western Union Telegraph Company, but at the close of the Government. The agreement is for ten years (expiring 18th April, 1891), but can be cancelled on one year's notice.
8	Baddeck (Loop Line).	13	Miss Dunlop.	50 00 do	Jan. 1, 1882	
9	Englestown.	6	Miss Bingham.	50 00 do	July 19, 1882	
10	Kelly's Cove (N. Campbell).	2	Miss M. C. Campbell.	50 00 do	April 1, 1885	
11	Big Bras d'Or.	5	Mrs. F. Livingston.	50 00 do	Jan. 1, 1889	
12	North Sydney.	12½				
	Totals.	128½		1,220 00		

ESTIMATED COST OF ANNUAL MAINTENANCE OF MAGDALEN ISLAND SYSTEM.

Local lines.	Salaries and repairs.	\$4,100 00
Cable—Repairs, say.		1,000 00
Total		\$5,100 00
Less probable revenue		1,400 00
Balance deficit.		\$3,700 00

Required in Estimates,
1890-91.

STATE OF CALIFORNIA
OFFICE OF THE COMMISSIONER OF THE LAND OFFICE

Station	Inter- mediate Distances	Overseer	Salaries per Annum	Date of Appointment	Remarks
1 Barrington	Miles. 0	W. C. Tol. Co.'s Agent	\$ 50 00 or com'n.	Dec. 18, 1889, N. B.	The commission is 25 p. c. upon all business to and from the office; said commission guar- anteed to be not less than at the rate of \$50 per annum.
2 New Brown (including 1 1/2 miles outside)	11	Miss E. A. Smith	50 00 do	April 1, 1890	
3 Cape Sabine Island Lighthouse (including 1 mile outside)	6 1/2	L. K. Boone	50 00 do	Dec. 18, 1889	
Total	17 1/2		150 00		

Estimated cost of annual maintenance—

Required in Estimates for 1889-90	\$200 00
Estimated revenue do	150 00

GOVERNMENT TELEGRAPH SERVICE—Continued.

LOW POINT, CAPE BRETON SECTION.

STATIONS.	Inter- mediate Distances.	Operators.	Salaries per Annum.	Date of Appointment.	Memo.
1 Lingan	Miles, 0	.....	\$ cts. 50 00 or com'n.	.....	N.B.—The commission is 25 p. c. upon all business to and from the office; said commission guaranteed not to be less than at the rate of \$50 per annum.
2 Low Point Lighthouse.....	5	St. Peters	50 00 do	Aug. 1, 1881	
Totals	5	.....	100 00	.....

Estimated annual maintenance and repairs:—

Land line—Salaries and repairs..... \$150 00 Required in Estimates, 1890-91.

EAST COAST SECTION.

N.B. In connection with the Signal Service a land line 288 miles in length has been erected between Canso and Halifax for a bonus of \$16,000, and is now maintained and operated by the Western Union Telegraph Company without further cost to the Government.

MABOU CHETICAMP, C. B., TELEGRAPH SYSTEM.

1 Mabou	0	Mrs. M. McDonald....	50 00 or com'n.	April 1, 1887	N.B.—The commission is 25 p. c. of the Government line tariff receipts, and is guaranteed to amount to not less than \$50 per annum.
2 Broad Cove.....	20	Mrs. A. Campbell....	do	Sept. 1, 1887	
3 Margaree Harbour.....	17	Mrs. M. A. McLellan ..	do	April 1, 1887	
4 N. E. Margaree (loop, 5 miles)	10	Miss R. M. Ross	do	Jan. 1, 1889	
5 Cheticamp	16	Mrs. M. Foote	do	April 1, 1887	
Totals	63	

Estimated cost of annual maintenance

\$650 00 Required in Estimates, 1890-91.

150 00

CHATHAM-ESCUMINAC, B. C., TELEGRAPH SYSTEM.

STATIONS.	Inter- mediate Distances.	Operators.	Salaries per Annum.	Date of Appointment	MEMO.
1 Chatham.....	Miles. 0	Great North-Western Telegraph Co.	\$ cts. 185 00	This amount is paid for supervision of the line and office accommodation at Chatham. The commission is 25 per cent. of the Government line tariff receipts, and is guaranteed to amount to not less than \$50 per annum.
2 Black Brook.....	5½	.....	50 00 or com'n.	.....
3 Bay du Vin.....	15	Miss M. Williston....	50 00 do	March 1, 1885	
4 Escuminac.....	9½	Mrs. A. Lewis.....	50 00 do	Sept. 1, 1885	
5 Point Escuminac Lighthouse...	12	H. W. Phillips, jun....	50 00 do	Feb. 1, 1885	
Totals.....	42		385 00		

Estimated cost of annual maintenance, salaries and repairs..... \$900 00 Required in Estimates, 1890-91.

Estimated revenue..... 150 00

GOVERNMENT TELEGRAPH SERVICE—Continued.

BAY OF FUNDY, N. B., TELEGRAPH SYSTEM.
GRAND MANAN SECTION.

No.	STATIONS.	Inter- mediate Distance.	Operators.	Salaries per annum.	Date of Appointment.	Memo.
	<i>Long Eddy Cable Hut, to</i>	Miles.		\$ cts.		
1	Flagg's Cove.....	3	Mrs. C. C. Seely (D. Supr.)	420 00	Nov. 18, 1880.	N. B.—The commission is 25 p. c. upon all business to and from the office; said commission guaranteed not to be less than at the rate of \$60 per annum. Seal Cove office closed since December, 1888. Southern Head Office closed 30th November, 1889.
2	Woodward's Cove.....	6	Miss J. S. Daggett.....	50 00	do 1, 1889.	
3	Grand Harbour.....	2	E. Cameron.....	50 00 or com'n.	April 1, 1885.	
4	Seal Cove.....	4½	F. A. Newton.....	50 00	do 1, 1887.	
5	Southern Head Lighthouse.....	5½	.....	50 00	do ..	
	Totals.....	21	D. McKay, Repairer ..	60 00	May 1, 1881.	
				730 00		

CAMPO BELLO SECTION.

	<i>Liberty Core Cable Hut, to</i>	Miles.		\$ cts.		
1	Welchpool.....	7½	M. A. Batson.....	100 00 or com'n.	May 1, 1890.	
2	Eastport, Maine, U. S. A.	½	J. Cushing.....	100 00	Dec. 26, 1881.	
	Totals.....	8		200 00		

ESTIMATED COST OF ANNUAL MAINTENANCE AND REVENUE.

Land lines—Salaries and repairs.....	\$1,600 00
Cable—Repairs, probably	1,000 00
Total	\$2,600 00
Less probable revenue.....	700 00
Balance deficit.....	\$1,900 00

Required in Estimates,
1890-91.

COLONIAL ISLAND QUARANTINE TELEGRAPH SYSTEM.

STATIONS.	Inter- mediate Postages.	Operators.	Salaries per Annum.	Date of Appointment.	Memo.
1. Quebec	0	Great North Western Telegraph Co.	180 00		
L'Anse-au-Loup					
2. St. Pierre (4 mile cable).	13	C. Turcott	50 00 or comm'n.	Mar. 1, 1885.	This amount is paid for supervision of the line, and covers rent of pole line in Quebec to L'Anse-au-Loup, for which \$25 per annum is charged.
3. St. Pierre	4				
4. St. Lawrence	4	Mrs. Bliss	50 00	Oct. 1, 1887	This commission is 25 per cent. of the Government line tariff, and is guaranteed to amount to not less than \$50 per annum.
5. St. Jean	6	M. Girard	50 00	Sept. 15, 1888	
6. St. Francois (including 4 miles cable)	7	P. Pothier	50 00	July 1, 1888	
7. Grosse Pointe quarantine office (do hospital)	7	M. Fournier	50 00	Mar. 1, 1885	
8. Total	11	M. Langlois (Telephone)	50 00	Sept. 1, 1885	
			485 00		

ESTIMATED COST OF ANNUAL MAINTENANCE.

Estimated line salaries and repairs	\$ 850 00
Other repairs	300 00
Required in Estimates, 1890-91	\$1,150 00
Estimated Revenue	\$ 200 00

GOVERNMENT TELEGRAPH SERVICE.—Continued.
CHICOUTIMI AND NORTH SHORE OF ST. LAWRENCE TELEGRAPH SYSTEM.
CHICOUTIMI SECTION.

No.	STATIONS.	Inter- mediate Distances.	Operators.	Salaries per Annum.	Date of Appointment.	Memo.
		Miles.		\$ cts.		
1	Bay St. Paul.....	0	F. Boivin.....	50 00 or com'n*	Previous to (April 1, 1885)	The commission upon business is 25 per cent. of the government tolls of the line; the amount guar- anteed to be not less than \$50 per annum.
2	St. Urbain.....	9	A. Boivin.....	50 00 do ..	do	
3	La Croche.....	37	(A. Gauthier (Repairer).)	50 00 do ..	do	
4	St. Alexis.....	31½	O. Pelletier.....	420 ..	May 15, 1887	
5	St. Alphonse de Bagotville ..	3	A. Simard.....	50 00 or com'n.	Jan. 1, 1889	
6	Chicoutimi.....	11½	D. Boly.....	50 00 do ..	April ..	
	Total.....	92		720 00	do 28, 1886	

MAINTENANCE.

Included with North Shore Section.

NORTH SHORE SECTION.

					Previous to	
1	Murray Bay.....	0	Mrs. F. Vincent.....	50 00 or com'n*	April 1, 1885	
2	Cap à l'Aigle.....	4	N. Duchesne.....	50 00 do ..	June 1, 1888	
3	St. Fidèle.....	6	A. N. Parent.....	50 00 do ..	April 1, 1890	
4	Port au Pesil.....	7	A. Brassard.....	50 00 do ..	May 1, 1889	
5	St. Siméon.....	4	D. Gaudin.....	50 00 do ..	Dec. 1, 1887	
6	Base des Rochers.....	12	G. Savard.....	50 00 do ..	June 1, 1887	
7	Riv. aux Canards.....	17	G. Bouillanne.....	50 00 do ..	Nov. 1890	
8	St. Etienne.....	17	(M. McLaren (Repairer).)	420 00	Dec. 1, 1887	
9	Tadoussac (14 mile cable) ..	13	J. E. Caron.....	50 00 or com'n.	Nov. 1, 1886	
10	Bergeronnes.....	15	M. Savard.....	50 00 do ..	do 1, 1888	
11	Escoumains.....	12	J. H. Topping.....	50 00 do ..	April ..	
12	Petit Roman.....	8	R. C. Argall.....	50 00 do ..	do	
13	Mille Vaches.....	8	J. A. Puise.....	50 00 do ..	June 1, 1889	
14	Portneuf Mills.....	11½		50 00 do ..	April 1, 1885	

Portneuf Mills office closed June, 1889.

No.	Particulars	No.	Particulars	Amount	Year
10	Supply and Carriage	31	100 00	1889	1889
11	Supply and Carriage	32	100 00	1890	1890
12	Supply and Carriage	33	100 00	1891	1891
13	Supply and Carriage	34	100 00	1892	1892
14	Supply and Carriage	35	100 00	1893	1893
15	Supply and Carriage	36	100 00	1894	1894
16	Supply and Carriage	37	100 00	1895	1895
17	Supply and Carriage	38	100 00	1896	1896
18	Supply and Carriage	39	100 00	1897	1897
19	Supply and Carriage	40	100 00	1898	1898
20	Supply and Carriage	41	100 00	1899	1899
21	Supply and Carriage	42	100 00	1900	1900
22	Supply and Carriage	43	100 00	1901	1901
23	Supply and Carriage	44	100 00	1902	1902
24	Supply and Carriage	45	100 00	1903	1903
25	Supply and Carriage	46	100 00	1904	1904
26	Supply and Carriage	47	100 00	1905	1905
27	Supply and Carriage	48	100 00	1906	1906
28	Supply and Carriage	49	100 00	1907	1907
29	Supply and Carriage	50	100 00	1908	1908
30	Supply and Carriage	51	100 00	1909	1909
31	Supply and Carriage	52	100 00	1910	1910
32	Supply and Carriage	53	100 00	1911	1911
33	Supply and Carriage	54	100 00	1912	1912
34	Supply and Carriage	55	100 00	1913	1913
35	Supply and Carriage	56	100 00	1914	1914
36	Supply and Carriage	57	100 00	1915	1915
37	Supply and Carriage	58	100 00	1916	1916
38	Supply and Carriage	59	100 00	1917	1917
39	Supply and Carriage	60	100 00	1918	1918
40	Supply and Carriage	61	100 00	1919	1919
41	Supply and Carriage	62	100 00	1920	1920
42	Supply and Carriage	63	100 00	1921	1921
43	Supply and Carriage	64	100 00	1922	1922
44	Supply and Carriage	65	100 00	1923	1923
45	Supply and Carriage	66	100 00	1924	1924
46	Supply and Carriage	67	100 00	1925	1925
47	Supply and Carriage	68	100 00	1926	1926
48	Supply and Carriage	69	100 00	1927	1927
49	Supply and Carriage	70	100 00	1928	1928
50	Supply and Carriage	71	100 00	1929	1929
51	Supply and Carriage	72	100 00	1930	1930
52	Supply and Carriage	73	100 00	1931	1931
53	Supply and Carriage	74	100 00	1932	1932
54	Supply and Carriage	75	100 00	1933	1933
55	Supply and Carriage	76	100 00	1934	1934
56	Supply and Carriage	77	100 00	1935	1935
57	Supply and Carriage	78	100 00	1936	1936
58	Supply and Carriage	79	100 00	1937	1937
59	Supply and Carriage	80	100 00	1938	1938
60	Supply and Carriage	81	100 00	1939	1939
61	Supply and Carriage	82	100 00	1940	1940
62	Supply and Carriage	83	100 00	1941	1941
63	Supply and Carriage	84	100 00	1942	1942
64	Supply and Carriage	85	100 00	1943	1943
65	Supply and Carriage	86	100 00	1944	1944
66	Supply and Carriage	87	100 00	1945	1945
67	Supply and Carriage	88	100 00	1946	1946
68	Supply and Carriage	89	100 00	1947	1947
69	Supply and Carriage	90	100 00	1948	1948
70	Supply and Carriage	91	100 00	1949	1949
71	Supply and Carriage	92	100 00	1950	1950
72	Supply and Carriage	93	100 00	1951	1951
73	Supply and Carriage	94	100 00	1952	1952
74	Supply and Carriage	95	100 00	1953	1953
75	Supply and Carriage	96	100 00	1954	1954
76	Supply and Carriage	97	100 00	1955	1955
77	Supply and Carriage	98	100 00	1956	1956
78	Supply and Carriage	99	100 00	1957	1957
79	Supply and Carriage	100	100 00	1958	1958
80	Supply and Carriage	101	100 00	1959	1959
81	Supply and Carriage	102	100 00	1960	1960
82	Supply and Carriage	103	100 00	1961	1961
83	Supply and Carriage	104	100 00	1962	1962
84	Supply and Carriage	105	100 00	1963	1963
85	Supply and Carriage	106	100 00	1964	1964
86	Supply and Carriage	107	100 00	1965	1965
87	Supply and Carriage	108	100 00	1966	1966
88	Supply and Carriage	109	100 00	1967	1967
89	Supply and Carriage	110	100 00	1968	1968
90	Supply and Carriage	111	100 00	1969	1969
91	Supply and Carriage	112	100 00	1970	1970
92	Supply and Carriage	113	100 00	1971	1971
93	Supply and Carriage	114	100 00	1972	1972
94	Supply and Carriage	115	100 00	1973	1973
95	Supply and Carriage	116	100 00	1974	1974
96	Supply and Carriage	117	100 00	1975	1975
97	Supply and Carriage	118	100 00	1976	1976
98	Supply and Carriage	119	100 00	1977	1977
99	Supply and Carriage	120	100 00	1978	1978
100	Supply and Carriage	121	100 00	1979	1979
101	Supply and Carriage	122	100 00	1980	1980
102	Supply and Carriage	123	100 00	1981	1981
103	Supply and Carriage	124	100 00	1982	1982
104	Supply and Carriage	125	100 00	1983	1983
105	Supply and Carriage	126	100 00	1984	1984
106	Supply and Carriage	127	100 00	1985	1985
107	Supply and Carriage	128	100 00	1986	1986
108	Supply and Carriage	129	100 00	1987	1987
109	Supply and Carriage	130	100 00	1988	1988
110	Supply and Carriage	131	100 00	1989	1989
111	Supply and Carriage	132	100 00	1990	1990
112	Supply and Carriage	133	100 00	1991	1991
113	Supply and Carriage	134	100 00	1992	1992
114	Supply and Carriage	135	100 00	1993	1993
115	Supply and Carriage	136	100 00	1994	1994
116	Supply and Carriage	137	100 00	1995	1995
117	Supply and Carriage	138	100 00	1996	1996
118	Supply and Carriage	139	100 00	1997	1997
119	Supply and Carriage	140	100 00	1998	1998
120	Supply and Carriage	141	100 00	1999	1999
121	Supply and Carriage	142	100 00	2000	2000
122	Supply and Carriage	143	100 00	2001	2001
123	Supply and Carriage	144	100 00	2002	2002
124	Supply and Carriage	145	100 00	2003	2003
125	Supply and Carriage	146	100 00	2004	2004
126	Supply and Carriage	147	100 00	2005	2005
127	Supply and Carriage	148	100 00	2006	2006
128	Supply and Carriage	149	100 00	2007	2007
129	Supply and Carriage	150	100 00	2008	2008
130	Supply and Carriage	151	100 00	2009	2009
131	Supply and Carriage	152	100 00	2010	2010
132	Supply and Carriage	153	100 00	2011	2011
133	Supply and Carriage	154	100 00	2012	2012
134	Supply and Carriage	155	100 00	2013	2013
135	Supply and Carriage	156	100 00	2014	2014
136	Supply and Carriage	157	100 00	2015	2015
137	Supply and Carriage	158	100 00	2016	2016
138	Supply and Carriage	159	100 00	2017	2017
139	Supply and Carriage	160	100 00	2018	2018
140	Supply and Carriage	161	100 00	2019	2019
141	Supply and Carriage	162	100 00	2020	2020
142	Supply and Carriage	163	100 00	2021	2021
143	Supply and Carriage	164	100 00	2022	2022
144	Supply and Carriage	165	100 00	2023	2023
145	Supply and Carriage	166	100 00	2024	2024
146	Supply and Carriage	167	100 00	2025	2025
147	Supply and Carriage	168	100 00	2026	2026
148	Supply and Carriage	169	100 00	2027	2027
149	Supply and Carriage	170	100 00	2028	2028
150	Supply and Carriage	171	100 00	2029	2029
151	Supply and Carriage	172	100 00	2030	2030
152	Supply and Carriage	173	100 00	2031	2031
153	Supply and Carriage	174	100 00	2032	2032
154	Supply and Carriage	175	100 00	2033	2033
155	Supply and Carriage	176	100 00	2034	2034
156	Supply and Carriage	177	100 00	2035	2035
157	Supply and Carriage	178	100 00	2036	2036
158	Supply and Carriage	179	100 00	2037	2037
159	Supply and Carriage	180	100 00	2038	2038
160	Supply and Carriage	181	100 00	2039	2039
161	Supply and Carriage	182	100 00	2040	2040
162	Supply and Carriage	183	100 00	2041	2041
163	Supply and Carriage	184	100 00	2042	2042
164	Supply and Carriage	185	100 00	2043	2043
165	Supply and Carriage	186	100 00	2044	2044
166	Supply and Carriage	187	100 00	2045	2045
167	Supply and Carriage	188	100 00	2046	2046
168	Supply and Carriage	189	100 00	2047	2047
169	Supply and Carriage	190	100 00	2048	2048
170	Supply and Carriage	191	100 00	2049	2049
171	Supply and Carriage	192	100 00	2050	2050
172	Supply and Carriage	193	100 00	2051	2051
173	Supply and Carriage	194	100 00	2052	2052
174	Supply and Carriage	195	100 00	2053	2053
175	Supply and Carriage	196	100 00	2054	2054
176	Supply and Carriage	197	100 00	2055	2055
177	Supply and Carriage	198	100 00	2056	2056
178	Supply and Carriage	199	100 00	2057	2057
179	Supply and Carriage	200	100 00	2058	2058
180	Supply and Carriage	201	100 00	2059	2059
181	Supply and Carriage	202	100 00	2060	2060
182	Supply and Carriage	203	100 00	2061	2061
183	Supply and Carriage	204	100 00	2062	2062
184	Supply and Carriage	205	100 00	2063	2063
185	Supply and Carriage	206	100 00	2064	2064
186	Supply and Carriage	207	100 00	2065	2065
187	Supply and Carriage	208	100 00	2066	2066
188	Supply and Carriage	209	100 00	2067	2067
189	Supply and Carriage	210	100 00	2068	2068
190	Supply and Carriage	211	100 00	2069	2069
191	Supply and Carriage	212	100 00	2070	2070
192	Supply and Carriage	213	100 00	2071	2071
193	Supply and Carriage	214	100 00	2072	2072
194	Supply and Carriage	215	100 00	2073	2073
195	Supply and Carriage	216	100 00	2074	2074
196	Supply and Carriage	217	100 00	2075	2075
197	Supply and Carriage	218	100 00	2076	2076
198	Supply and Carriage	219	100 00	2077	2077
199	Supply and Carriage	220	100 00	2078	2078
200	Supply and Carriage	221	100 00	2079	2079
201	Supply and Carriage	222	100 00	2080	2080
202	Supply and Carriage	223	100 00	2081	2081
203	Supply and Carriage	224	100 00	2082	2082
204	Supply and Carriage	225	100 00	2083	2083
205	Supply and Carriage	226	100 00	2084	2084
206	Supply and Carriage	227	100 00	2085	2085
207	Supply and Carriage	228	100 00	2086	2086
208	Supply and Carriage	229	100 00	2087	2087
209	Supply and Carriage	230	100 00	2088	2088
210	Supply and Carriage	231	100 00	2089	2089
211	Supply and Carriage	232	100 00	2090	2090
212	Supply and Carriage	233	100 00	2091	2091
213	Supply and Carriage	234	100 00	2092	2092
214	Supply and Carriage	235	100 00	2093	2093
215	Supply and Carriage	236	100 00	2094	2094
216	Supply and Carriage	237	100 00	2	

GOVERNMENT TELEGRAPH SERVICE—Continued.

ONTARIO: PELEE ISLAND TELEGRAPH SYSTEM.

No.	STATIONS.	Intermediate Distances.	Agents.	Salaries per Annum.	Date of Appointment.	Memo.
1	Leamington		G. McR. Selkirk	\$50	Nov. 1, 1888.	Accountant and General Agent.
2	Point Pelee	12 } 8½ }	W. A. Grubb	Consn. 25 p. c.	do ..	The commission is upon the receipts for Government line.
	Cable to Island		C. B. Quick	do	do	
3	North Dock	1½	A. M. McCormick	do	do	
4	West Dock	5	F. B. McCormick	do	do	
5	South Dock	4½				
	Total	31½				

This line is operated with telephones.

Estimated cost of actual maintenance..... \$250

The revenue will about cover the maintenance expenditure.

FINES IN THE SOUTHERN WEST TERRITORY.
OF THE APPLICABLE TARIFFS AND DUTIES.

No.	STATION.	Intermediate Distances.	Operators.	Salaries per Annum.	Date of Appointment.	Month.
		Miles.		\$ cts.		
1	Qu'Appelle	0	E. W. Warner	720 00	Jan. 1, 1883	
2	Fort Qu'Appelle	17	Mrs. A. Johnston	600 00	Mar. 1, 1883	
3	Trail	46	A. Von Linschlag	600 00	Nov. 1, 1883	
4	Humboldt	78	J. M. Anderson	720 00	May 1, 1884	
5	Clarks Crossing	55	R. J. Mahon, Agent	720 00	do 1, 1884	
6	Harrison	38	J. Harrington, Repairer	600 00	Jan. 1, 1886	
7	Fort Assiniboine	47	W. S. Murray, Repairer	720 00	Oct. 1, 1886	
8	Fort Pitt	89	L. P. O. Neil	720 00	Apr. 15, 1889	
9	McMurray	80	H. S. Soren, Repairer	600 00	May 1, 1889	
10	Nebraska Lake	41	W. M. McDonald, Repairer	600 00	Apr. 15, 1890	
11	Nebraska	37	George Voyer, Repairer	600 00	Oct. 1, 1889	
12	Fort Saskatchewan	49	J. F. Lake	600 00	do 1, 1889	
13	Edmonton	24	W. C. Gillis, Repairer	720 00	Jan. 1, 1887	
			W. G. Ross, Agent	25 p. c.	Dec. 1886	
			A. Taylor, Agent	720 00	Pres. to 1882	
			W. McKay, Repairer	720 00	May 1, 1886	
<i>Branches</i>						
14	Fort Assiniboine	0	A. Gumpert	600 00	Apr. 15, 1889	
15	Fort Assiniboine	42	H. McDonald	720 00	Aug. 1, 1888	
16	Fort Assiniboine	9	N. P. O. Neil	720 00	June 1, 1889	
17	Fort Assiniboine	23	L. J. Rankin	720 00	March, 1887	
18	Nebraska	0	See notes.			
19	Fort Assiniboine	14				
20	Fort Assiniboine	0				
21	Fort Assiniboine	9				
		Total				
		600				

a. The Saskatoon and St. Albert branch lines are operated with telephones.

Estimated cost of critical maintenance salaries, supplies and repairs, including the Wind Mountain Section required in Estimates, 1890-91, \$25,000.

GOVERNMENT TELEGRAPH SERVICE—Continued.

NORTH-WEST TELEGRAPH LINES.—WOOD MOUNTAIN AND FORT MACLEOD SECTIONS.

STATIONS.	Intermediate Distances.	Operators.	Salaries' per Annum.	Date of Appointment.	Memo.
	Miles.		\$ cts.		
<i>Fort MacLeod Line—</i>					
1 Galt Junction.....	0				The Fort MacLeod line has been leased to the North-West Coal and Navigation Co. at 5 per cent. per annum upon cost of construction.
2 Lethbridge.....	107				
3 McLeod.....	28½				
4 Fort MacLeod.....	28½				
<i>Wood Mountain Line—</i>					
1 Moose Jaw.....	0	H. Rutherford.....	240 00	June 1, 1885..	The Wood Mountain line has been operated by telephone since May, 1890.
2 Wood Mountain.....	90½	J. H. Thompson.....	240 00	do 1, 1890..	
Total.....	226½		480 00		

GOVERNMENT TELEGRAPH SERVICE IN BRITISH COLUMBIA.

[1890]

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Office.	Inter- mediate Distances.	Names.	Positions.	Salaries per Month.	Date of Appointment.	Memo.
	Miles.			\$ cts.		
Ashcroft Station.....	0	C. P. Ry. Telegraph.	Operator and repairer	60 00	Feb. 16, 1885	This line is now operated by the Canadian Pacific Railway Co. for the Government. The arrangement being terminable at any time.
Catch Creek.....	4	H. L. Good.....	do	50 00	do 1883	
Clinton.....	26	J. A. Le Bourlaim.....	do	50 00	May 1, 1890	
Bridge Creek.....	53	W. Walker.....	do	60 00	June 1, 1886	
Soda Creek.....	78	H. Yates.....	do	47 00	Apr 28, 1882	
Quesnelle.....	54½	Miss I. Barlow.....	Operator.....	83 33	Feb. 17, 1873	{ This line was leased for 99 years to Messrs. J. A. Laidlaw and J. Wilson, on the 30th October, 1887.
Stanley.....	48	Jas. Stone.....	Operator and repairer ..			
Barkerville.....	13					
<i>Branch.</i>						
New Westminster.....	276½					
Ladner's Landing (½ mile cable).....	18					
Total.....	294½					

Estimated cost of maintenance, including general repair of line, \$6,500, required in Estimates, 1890-91.

APPENDIX A.

GOVERNMENT TELEGRAPH SERVICE OFFICE,
OTTAWA, 29th January, 1890.

A. GOBEL, Esq.,
Secretary Public Works.

SIR,—Having reference to the annexed plan, I have the honor to report that the Bird Rock, Magdalen Islands, cable 18½ nautical miles in length was laid in from 10 to 15 fathoms soundings on October 20, 1890, and has the following very unsatisfactory record as to maintenance;

BIRD ROCK CABLE.

October 20, 1880. Laid.

December, 1, 1880. Damaged by storm and stopped working.

“ 1881. Twice broken and repaired; worked irregularly.

“ 1882. Repaired, but not worked. (Operator killed by an explosion of powder.)

July 22, 1883. Taken up and relaid to west side of rock.

“ 1884. Successfully operated.

“ 1885. do

March 22, 1886. Broken by ice.

June 11, 1886. Repaired.

April 22, 1887. Broken by ice.

June 1, 1887. Repaired.

April 22, 1888. Broken by fallen rock.

August 20, 1888. Repaired.

April 26, 1889. Broken by ice.

May 28, 1889. Repaired.

December 3, 1889. Broken, and not yet repaired.

It will thus be noted that the cable was unavailable for ice reports, for which it was originally and principally intended, during the springs of 1881, 1882, 1883, 1886, 1887, 1888 and 1889; and was only in working order when the ice was moving during 1884 and 1885.

A reference to the plan will show that the ship's course in the Gulf of St. Lawrence to and from Europe is within view of the Bird Rocks and also of St. Paul's Island, the latter being always sighted when possible.

The soundings between Meat Cove and St. Paul's Island and also at the landing coves upon St. Paul's are in every way favorable for the maintenance of a cable connection; and St. Paul's Island is a point much better adapted than the Bird Rocks for a signalling station where vessels could obtain information as to Gulf ice, etc.

In confirmation of the foregoing remarks, I have the honour to annex a report from Capt. Guildford of the S. S. "Newfield" to the Hon. the Minister of Marine and Fisheries wherein he calls attention to the great cost, danger, and subsequent inability of repairing the Bird Rock cable, and to the advisability of taking it up and relaying it between Meat Cove and St. Paul's Island.

In this view the Hon. the Minister of Marine and Fisheries fully concurs; and being of the same opinion, I have the honor to recommend that a sum of \$3,000 may be placed in the Estimates for 1890-1891 for the additional cable and other material required for the alteration.

I may add that although the Bird Rock Cable has been submerged ten years, I am of opinion that it is embedded in a sandy bottom, and that nine-tenths of its length will be found to be in good order and suitable for removal.

I have the honour to be, Sir,

Your obedient servant,

F. N. GISBORNE,
Supt. Tel. Service.

Ref. No. 105,524.

OTTAWA, 1st February, 1890.

DEAR SIR HECTOR,—I beg to enclose herewith for your consideration a copy of a communication from Captain R. A. Guilford, of the Government cable steamer "Newfield," with reference to the Bird Rock cable, and I would strongly recommend that it be taken up and relaid from Meat Cove, C.B., to Saint Paul's Island.

Yours faithfully,

CHARLES H. TUPPER.

The Honorable

Sir HECTOR LANGEVIN, K.C.M.G., C.B.

Minister of Public Works.

HALIFAX, 22nd January 1890.

To the Honorable Minister of Marine and Fisheries,

SIR,—I wish to give you a report and explanation on the Bird Rock cable.

In the fall of 1880, I landed the cable there on the Rock and it only stood five weeks when it chafed through. In the spring of 1881 I repaired it, but during the summer it again gave out and I again repaired it. In 1882 it chafed through again in the spring. In the fall I was six weeks trying to land and at last lost a man who was washed off the deck. I was then allowed to shift the cable around to where it is at present. Although I consider it to be in the best place, we can never rely on it or know when it will give out. The ice catches it up and crushes it against the boulders, even in spite of those heavy pieces that Mr. Gisborne had made specially for that place. Perhaps you are not aware that three years ago I nearly lost my life there together with all hands. Not feeling altogether safe under the cliff, I ordered the boats away and I had only rowed off a short distance when an immense mass of earth and rocks fell down from above directly on the cable. So it is no wonder that I don't like the place and say that it is a needless expense to the country to keep a cable there. The Hon. Minister of Marine and Fisheries was on board one day and I explained everything to him. He said, "We will have it moved if that is the case," but as it stood for a twelvemonth after I shifted it, nothing more was said about the matter. Now, I mean to tell you that this cable is decidedly in the wrong place, and the sooner the Government know it the better. The key of the Gulf of St. Lawrence is St. Paul's Island. We have a large number of passenger ships coming up to Quebec and Montreal, and with them time is everything for both mails and passengers and the country's good. As you are well aware the Straits of Belle Isle are blocked with ice in the spring, which would make St. Paul's the proper place for a Signal Station, more so than anywhere else in the Gulf of St. Lawrence; all ships shave the island coming up and they can easily ascertain from there how the ice is up the gulf, which is what they most want to know. By taking up that cable from Bird Rock to Grosse Isle and adding a few miles more, you would have enough to accomplish the job and I see no reason why it would not stand for ages, as the water is too deep for vessels to interfere with it, and the ice would have but little chance to crush it. The people of Quebec and Montreal will see the benefit of this, and I may say every place in the gulf if the change was made. As the Bird Rock cable is gone again, of course it is wanted. Therefore, you will see the advisability of doing this yourself. Of course, I consider it my duty at all times to give you my opinion regarding cable or anything else.

I am, &c.,

R. A. GUILFORD.

THE DOMINION GOVERNMENT TELEGRAPH SERVICE.

The Superintendent of the Telegraph and Signal Service refers to the recommendations of the Select Committee appointed, in 1876, by the House of Commons, to enquire into the possibility of establishing a sub-marine and land telegraph line system for the River and Gulf of St. Lawrence and Atlantic coast of the Dominion—and to the works since carried out by the Government—and makes the following recommendations :—

1. That a steamer be purchased for the service. Cost, about \$60,000.
2. That cable connection be extended to the Straits of Belle-Isle.
3. That cable connection be made with Sable Island, and
4. That cable connection be made with Scatarie Island, and that a shore line be extended from Main-à-Dieu *via* Louisburg to St. Peter's, Cape Breton.

THE DOMINION GOVERNMENT TELEGRAPH SERVICE,

OTTAWA, 11th July, 1890.

A, GOBEL, Esq.,
Secretary, Public Works.

SIR,—For the information of the Honourable the Minister of Public Works, I have the honour to report :—

That in the year 1876 a Select Committee was appointed by the House of Commons, Canada, to enquire into the possibility of establishing a sub-marine and land telegraph line system for the River and Gulf of St. Lawrence and Atlantic coast of the Dominion.

Théodore Robitaille, Esq., M.P., was selected as Chairman, and valuable evidence was submitted by the Hon. Dr. Fortin, M.P.; Wm. Smith, Deputy Minister and other officials of the Department of Marine and Fisheries; A. G. Yeo, M.P., Prince Edward Island; P. Power, M.P., Nova Scotia; Hon. Wm. Muirhead, New Brunswick; Sir Donald A. Smith, M.P., Manitoba; Hon. D. E. Price, E. W. Sewell, Harbour Commissioners; N. Rosa, E. H. Dinning, Quebec; W. A. Schwartz, Consul General for Norway and Sweden; H. Lyman, President of the Montreal, and Joseph Shehyn, President of the Quebec Boards of Trade; Lloyds Agency; and many other gentlemen of experience and note.

From such representative evidence, throughout the Dominion, it appears :—

1. That in 1875, 4,045 vessels of 2,738,376 tonnage, valued at \$129,184,000; with crews of 77,927 men navigated the River and Gulf of St. Lawrence, or otherwise entered the ports of Nova Scotia and New Brunswick; the value of said vessels and cargoes being \$216,282,000, to which must be added coasting and fishing vessels, (which do not appear in the Trade Returns), valued at \$3,500,000, and carrying crews of 205,000 men.

2nd. That during the six previous years, 1869 to 1875, 144 vessels of 58,000 tonnage, valued at \$1,534,000, and 98 lives were lost in the River and Gulf of St. Lawrence; eight of which were wrecked on St. Paul's Island.

3rd. That a number of such vessels could have been saved had there been any telegraphic connections with Anticosti, the Magdalen and other Islands, whereby timely assistance could have been obtained; and that terrible sufferings, in some cases resulting in cannibalism, could have been thereby prevented.

4th. That the reduction in insurance rates upon vessels, consequent upon telegraphic facilities would amount to not less than 12½ per cent.= \$210,000, and probably 25 per cent.= \$420,000 per annum.

N. B.—The actual reduction to date has been 50 per cent.

The result of such varied and important testimony was an *unanimous* recommendation, that the Federal Government be petitioned to inaugurate a telegraph and signal service system based upon the following recommendations :—

1st. That a land line be extended from Murray Bay to Mingan; estimated to be 385 miles in length and to cost \$101,250.

N.B.—Now erected to Point aux Esquimaux, 24 miles east of Mingan. The actual distance being 496 miles (exclusive of the branch lines to Chicoutimi and St. Etienne, 109 miles) and the cost \$111,000.

2nd. A submarine cable from Mingan to Anticosti; estimated distance, 24 miles, and cost \$36,000.

N.B.—This connection will be completed during the present summer of 1890; distance, 24 miles, and probable cost, including services of the S.S. Newfield, \$16,000.

[*P.S.*—This cable was laid between Mingan and Mechastic Bay, Anticosti, on 22nd August, 1890, distance $20\frac{1}{2}$ miles.]

3rd. A submarine cable from Anticosti to Gaspé; estimated distance, 38 miles; cost \$57,000.

N.B.—This connection was made in 1880; the actual length being $44\frac{1}{2}$ miles, and the cost \$48,700.

4th. A land line from Fox Bay to East Cape Anticosti; estimated distance, 145 miles, and cost \$43,500.

N.B.—This line was constructed in 1880; the actual distance being 214 miles, *plus* 28 miles for the Gaspé connection. Total cost, \$38,300.

5th. A submarine cable from the Magdalen Islands to Cape Breton, Nova Scotia; estimated distance 48 miles, and cost \$72,000.

N.B.—This connection was made in 1880; the actual length being 55 miles, and the cost \$60,500.

6th. A submarine cable from Magdalen Islands to Bird Rock; estimated distance 16 miles and cost \$24,000.

N.B.—This cable was laid in 1880; the actual length being $19\frac{1}{4}$ miles and cost \$20,000.

[*P.S.*—In consequence of ice movements and rock falls, rendering this cable inoperative 8 years out of 10, the route was abandoned, and 16 knots of the cable having been recovered in good order, it was re-laid, *plus* 4 knots additional cable, between Meat Cove and St. Paul's Island, on 6th September, 1890.]

7th. A land line on the Magdalen Islands; estimated distance, 38 miles, and cost \$6,840.

N.B.—This line was erected in 1880; actual distance, $83\frac{1}{2}$ miles, and cost \$10,855.

8th. A land line from St. Lawrence Bay to Baddeck, Cape Breton; estimated distance, 75 miles, and cost \$7,500.

N.B.—This line was erected in 1880-81; actual distance, $128\frac{1}{2}$ miles, and cost \$14,465.

9th. A land line from Chatham to Point Escuminac, New Brunswick; estimated distance, 25 miles, and cost \$2,500.

N.B.—This line was erected in 1884; actual distance, 42 miles, and cost \$4,500.

10th. A land line from Matane to Fox River, Gaspé; estimated distance, 165 miles, and cost \$18,500.

N.B.—This line was subsequently erected and maintained by the "Montreal Telegraph Company," in consideration of a bonus, once and for all, of \$16,000.

11th. A submarine cable from St. Paul's Island to Cape Breton; estimated distance, 16 miles, and cost \$24,000.

N.B.—This cable will be laid during the present summer, 1890; the estimated distance being 19 miles, and the probable cost \$3,000, *plus* the value of the old Bird Rock Cable (that connection having been abandoned as too costly and almost impossible to maintain), which is to be utilized for that purpose.

[*P.S.*—This cable, $20\frac{1}{4}$ miles in length, was laid on the 6th September, 1890.]

12th. A land line from Miscou to Shippegan, New Brunswick; estimated distance, 25 miles, and cost \$2,500.

N.B.—This line is again placed upon the Estimates for 1891-92; the actual distance being probably 25 miles, and the cost, including $1\frac{1}{2}$ miles of cable, \$5,200.

13th. Short land line extensions to north and east points, Prince Edward Island; estimated distances, 18 miles, and cost \$1,800.

N.B.—These connections are again placed upon the Estimates for 1891-92; the actual distances being 24 miles, and the probable cost \$3,000.

It will thus be noted that *every one* of the items recommended by the Committee (excepting the inconsiderable items Nos. 12 and 13) have been carried out by the present administration at a total cost of \$343,320 (*versus* original estimates amounting to \$369,090) although the actual lengths of lines and cables proved to be greatly in excess of such original estimates.

Finally, the Committee strongly recommended that a steamer suitable for cable laying and for towing and wrecking should be attached to the Telegraph Service.

N.B.—Hitherto the S.S. "Newfield" has been utilized for cable work at an annual cost of \$5,000; but there are now so many cables, liable to interruption, that when most required the "Newfield" is not always available. A suitable steamer which could be purchased for about \$60,000, might be attached exclusively to the Telegraph Service, such vessel could be profitably employed in towing, wrecking, &c., when not otherwise engaged upon the Telegraph Service.

Over and above the recommendations of the Special Committee of 1876, the Federal Government have added the following submarine and land line connections to their Gulf and Coast telegraph systems.

1st.—A coast land line from Canso to Halifax; distance 208 miles; cost, \$18,500.

2nd.—A submarine cable and land lines connecting Campobello and Grand Manan Islands with New Brunswick; distance, 29 miles; cost \$11,000. (*Plus* an extension to Whitehead Island, September, 1890; distance, 6 miles.)

3rd.—A coast land line from Mabou to Cheticamp, Cape Breton; distance, 53 miles; cost \$6,000.

4th.—Submarine cables and land lines from Barrington to Cape Sable Island, Nova Scotia; distance, 17½ miles; cost \$3,500.

5th.—Submarine cables between Digby, Long and Brier Islands, Nova Scotia; lengths, 1½ miles, cost \$3,000.

6th.—Submarine cables and land lines from Quebec and Grosse Isle Quarantine Station; distance, 52 miles, cost \$22,200.

The annual cost of maintenance of all the foregoing connections, during 1889-1890, amounted to \$36,660, less \$6,403 revenue. All Meteorological, Shipping and Fishery Bulletin reports having been transmitted free of charge.

The actual general reduction in Marine Insurance premiums since 1875-76 has been 50 per cent.; and, through the telegraph and other facilities, vessels navigating Canadian waters have benefited in like ratio; thus the cost of maintenance, \$30,257, *plus* the annual interest upon \$389,000 at 4 per cent. \$15,560, or in all \$45,817, is a mere fraction of the yearly saving effected upon Marine Insurance premiums alone.

In conclusion, I have the honour to recommend to the favourable consideration of the Honourable the Minister of Public Works:—

1st. That a steamer be purchased for the Service;

2nd. That cable connection be extended to the Straits of Belle-Isle;

3rd. That cable connection be made with Sable Island; and

4th. That cable connection be made with Seatarie Island, and a shore line be extended from Main-à-Dieu *via* Louisburg to St. Peter's, Cape Breton:

In order to complete the positive requirements of the Federal Coast Telegraph system.

I have the honour to be, Sir,

Your obedient servant,

F. N. GISBORNE,

Superintendent Telegraph Service.

APPENDIX No. 13.

TABULAR STATEMENT

SHOWING THE DATES OF THE

OPENING AND CLOSING OF NAVIGATION,

AT THE

PRINCIPAL PORTS OF CANADA,

ON THE SEABOARD AND ON THE GULF, RIVER AND LAKES
ON THE ST. LAWRENCE.

STATEMENT of the Closing of Navigation in the Fall of 1889, and of the Opening in the Spring of 1890.

Name of Port.	Location.	Closed in 1889.	Opened in 1890.	Remarks.
Charlottetown, P.E.I.	Gulf St. Lawrence.	December 31.	April 10.	Neap tides, 6 to 8 feet; spring tides, 9 to 10½ feet.
Georgetown do	do	Feb. 11, 1890.	March 15.	Neap tides, 3 feet 6 inches; spring tides, 5 feet 6 inches.
Pictou, N.S.	do	Jan. 5, 1890.	do 21.	Ordinary average tide, four feet.
Sydney do	do	do 9, 1890.	April 11.	2½ to 3 feet. 16 feet of water at high tide.
Shediac, N.B.	do	December 13.	do 21.	At Fergusen's wharf, so called, now Mowat's, at average low tide, 15 to 16 feet.
Campbellton do	Baie des Chaleurs.	November 25.	May 6.	
Bathurst do	do	December 4.	do 3.	Rise and fall, about 6 feet. Depth of water at wharves, from 25 to 30 feet.
Gaspé Basin P.Q.	Gulf St. Lawrence.	December 24.	May 20.	Rise and fall, about 23 feet. Depth of water at low tide, about 14 feet.
Thetford do	River St. Lawrence.	November 28.	March 29.	
Quebec do	do	do 28.	April 29.	
Sorel do	do	do 30.	do 16.	
St. John's do	River Richelieu.	December 3.	do 12.	
Montreal do	do	November 23.	do 30.	
Three Rivers do	River St. Lawrence.	do 25.	do 20.	
Out. do	do	Jan. 23, 1890.	March 31.	
Kingston, do	Lake Ontario.	November 30.	April 12.	18 feet at end of pier.
Belleville do	do	December 8.	March 29.	13 to 14 feet.
Port Hope do	do	do 27.	do 5.	Navigation was not closed for a single day.
Toronto do	Lake Erie.	do 28.	April 11.	
Port Stanley do	do	November 18.	do 27.	
Port Dover do	Detroit River.	do 18.	April 11.	
Windsor do	Lake Huron.	Jan. 4, 1890.	March 25.	
Sarnia do	do	November 28.	April 5.	
Goderich do	do	do 6.	do 18.	
Kincardine do	do	December 7.	do 14.	
Owen Sound do	Georgian Bay.	do 3.	do 18.	
Collingwood do	do	November 16.	do 15.	17 feet.
Warton do	do	December 4.	do 20.	
South Ste. Marie do	Lake Superior.	do 21.	May 2.	15 feet 6 inches, at the outer end of the Canadian Pacific pier.
Port Arthur do	do	November 19.	April 21.	
Winnipeg, Man.	Red River.	do	do	

APPENDIX No. 14.

STATEMENTS.

1ST.—CONTRACTS LET BY THE DEPARTMENT.

2ND.—PROPERTY PURCHASED BY THE DEPARTMENT.

3RD.—PROPERTY LEASED BY OR TO THE GOVERNMENT.

DURING THE FISCAL YEAR ENDED 30TH JUNE, 1890.

No. 1.—CONTRACTS let by the Department of Public Works, &c.—*Continued.*

Works.		Names of Contractors.	Date of Contract.	Amount.
PUBLIC BUILDINGS— <i>Continued.</i>				\$ cts.
<i>Prince Edward Island.</i>				
Charlottetown Public Building—Supply of coal.....		C. Lyons.....	Aug. 31, 1889	466 08
Montague do do.....		J. Kenna.....	do 8, 1889	60 00
Summerside do do.....		J. Read & Co.....	do 8, 1889	213 29
<i>New Brunswick.</i>				
Bathurst Public Building—Supply of coal.....		R. P. McGivern.....	Aug. 8, 1889	327 80
Chatham do do.....		E. Johnson.....	do 8, 1889	124 22
Dalhousie do Hot water heating apparatus.....		Thos. Campbell.....	Jan. 2, 1890	659 00
Fredericton do Supply of coal.....		Jas. Tibbits.....	Aug. 17, 1889	300 40
Moncton do do.....		Cumberland Railway and Coal Co.....	do 8, 1889	176 38
Newcastle do do.....		E. Johnson & R. P. McGivern.....		352 99
Portland do do.....		R. P. & W. F. Starr.....	Aug. 24, 1889	28 33
St. John Public Buildings do do.....		R. P. & W. F. Starr & R. P. McGivern.....	do 24, 1889	2,656 77
St. Stephen Public Building do.....		C. D. Hill & Co.....	do 8, 1889	152 88
Sussex Public Building—Supply of coal.....		R. P. McGivern.....	Aug. 8, 1889	136 09
Woodstock do do.....		C. D. Hill & Co.....	do 17, 1889	221 85
do do Incandescent lighting.....		H. A. Connell.....	Oct. 5, 1889	80 00
				per annum.
<i>Quebec.</i>				
Aylmer Public Building—Supply of coal.....		G. W. McCullough.....	Aug. 14, 1889	156 82
do do Wall, fence and gate.....		D. B. McDonald.....	do 22, 1889	1,206 00
Coaticook do Supply of coal.....		W. C. Webster.....	do 20, 1889	33 00
do do Supply of water.....		Coaticook Water Co.....	Sept. 21, 1889	40 00
				per annum.
Carillon Collector's Office, Carillon Canal—Construction of verandah.....		J. P. Middleton.....	Oct. 9, 1889	420 00
Fraserville Post Office—Construction.....		A. Lortie.....	Dec. 27, 1889	8,990 00
Grosse Ile Quarantine Station—Sundry repairs.....		F. Poitras.....	Aug. 31, 1889	425 00
Hull Post Office—Supply of coal.....		G. W. McCullough.....	do 14, 1889	156 82
Joliette Public Building—Supply of coal.....		Collège Joliette.....	do 8, 1889	350 31
do do Additional works.....		Geo. Beaucage.....	do 31, 1889	2,732 00
Lachine Post office—Construction.....		J. Fitzpatrick.....	Sept. 30, 1889	7,950 00
Montreal Public Buildings—Supply of coal.....		G. W. Cameron.....	Aug. 14, 1889	3,789 69
Quebec do do and fuel wood.....		Madden & Ellis.....	do 16, 1889	1,458 19
St. John Public Building—Supply of coal.....		Bissett & Donaphy.....	do 8, 1889	147 00
St. Jérôme do Electric lighting.....		J. H. Matte.....	Jan. 22, 1890	160 00
				per annum.
Sherbrooke do Supply of coal.....		Lucke & Mitchell.....	Aug. 8, 1889	229 25
Sorel do do.....		H. C. Charland & Co.....	do 8, 1889	218 00
Three Rivers Public Buildings do.....		Z. Marchand.....	do 8, 1889	554 39
<i>Ontario.</i>				
Almonte Public Building—Drain.....		R. Cameron.....	Aug. 26, 1889	400 00
Amherstburg do Supply of coal.....		Mullen & Co.....	do 8, 1889	181 43
Barrie do do.....		Johnston & Sargeant.....	do 8, 1889	252 00
Belleville do do.....		The Downey Co.....	do 15, 1889	408 00
Berlin do do.....		J. Fennell.....	do 8, 1889	193 45
Brampton do Hot water heating apparatus.....		McGuire & Bird.....	Jan. 2, 1890	1,250 00
Brantford do Supply of coal.....		T. Elliott.....	Aug. 8, 1889	186 26
Brockville do Alterations and repairs.....		A. Heath.....	do 3, 1889	178 00
do do Supply of coal.....		Central Can. Coal Co.....	do 8, 1889	202 75
do do Plumbing and carpentering work.....		E. Smart.....	June 30, 1890	550 00

No. 1.—CONTRACTS let by the Department of Public Works, &c.—Continued.

Works.	Names of Contractors.	Date of Contract.	Amount.
PUBLIC BUILDINGS—Continued.			\$ cts.
<i>Contracts Concluded.</i>			
Boiling Supply of coal	T. Martindale	Aug. 8, 1889	143 75
do do	J. L. Scott	do 8, 1889	253 39
do do	Coulson & Robertson	do 8, 1889	229 00
do do	Grant & Conroy	do 8, 1889	258 00
Hot water heating apparatus	Garth & Co.	March 18, 1890	1,225 00
Supply of coal	J. Malcolm	Aug. 8, 1889	174 58
Buildings do	The Rathlam Company	do 8, 1889	240 00
Boiling do	Klopper & Co.	do 8, 1889	146 67
Buildings do	J. E. Mackay & Sons & T.	do 8, 1889	878 40
Boiling Tower clock	J. E. Ellis & Co.	Oct. 18, 1889	1,947 00
Buildings Supply of coal	Breck & Booth	Aug. 27, 1889	591 00
Supply of coal	The Rathlam Co.	do 8, 1889	312 69
Boring well and fittings for	P. Navin	Oct. 1, 1889	1,363 00
Boiling Supply of coal	J. Mann & Sons and D.	do 8, 1889	641 15
Boiling Additions and furnishing	Daly & Son	Aug. 20, 1889	710 00
Supply of coal	Geo. Newlands	Oct. 2, 1889	710 00
Tower clock	The Rathlam Co.	Aug. 8, 1889	300 00
Hot water heating apparatus	F. W. Smith & Bro.	Oct. 31, 1889	1,975 00
P. O. fitting	Garth & Co.	March 18, 1890	950 00
Supply of coal	Tambling & Jones	Feb. 3, 1890	1,100 00
Bureau Glass partitions in bindery	Jas. Morrison	Aug. 8, 1889	119 04
Stationery Fittings for Stationery	J. E. Askwith	July 11, 1889	1,222 00
do do	do	Aug. 10, 1889	4,500 00
Implements Farm Implement house and	Wm. Stewart	do 10, 1889	4,835 00
Steel and addition to	do	Nov. 22, 1889	823 00
Maintenance	L. Giarlo	Aug. 20, 1889	4,500 00
Heating apparatus	Dunlop & Chapman	Dec. 30, 1889	1,500 00
Post Office fittings	Munn & Beatty	March 12, 1889	1,800 00
Supply of coal	Peterborough Gas Co.	Aug. 8, 1889	102 78
do do	Brown & Hanning	do 8, 1889	230 00
Vaults	Ward, Cairns & Steel	do 10, 1889	1,000 00
Hot water heating ap-	F. Smart	Dec. 30, 1889	1,500 00
paratus	Ward, Cairns & Steel	March 27, 1890	1,500 00
Inter-office fittings for P. O.	Max	Aug. 8, 1889	800 00
Fittings for Customs	H. O. Lee	Aug. 8, 1889	274 08
Supply of coal	F. W. A. Lewis	Aug. 8, 1889	57 70
Heating apparatus	Max	Aug. 8, 1889	700 00
do do	A. C. M. West	Aug. 8, 1889	800 00
Alterations and additions	Scott & Green	Nov. 10, 1889	2,200 00
Erection	Lewis & Cluff	Jan. 31, 1890	14,100 00
Hot water heating ap-	Garth & Co.	March 18, 1890	1,500 00
paratus	Lewis & Cluff	May 5, 1890	2,000 00
Fittings	Ward, Cairns & Steel	Aug. 22, 1889	2,541 03
Supply of coal	Parry, Mackay & J.	do 8, 1889	1,007 00
Alternations, &c., plumbing	J. L. Scott	Aug. 16, 1889	1,000 00
do do	T. Price	Aug. 16, 1889	1,000 00
Grand the pavement	R. E. Smith	Aug. 16, 1889	1,200 00
Buildings Fittings for C. H. office	W. Atter	Aug. 20, 1889	400 00
do do	C. Green	Aug. 8, 1889	2 00
Electric lighting	W. J. Clark	Dec. 12, 1889	2,000 00
Supply of coal	Olette & Wherry	Aug. 8, 1889	443 00

No. 1.—CONTRACTS let by the Department of Public Works, &c.—*Concluded.*

Works.	Names of Contractors.	Date of Contract.	Amount.
PUBLIC BUILDINGS—Continued			\$ cts.
<i>Manitoba.</i>			
Brandon Experimental Farm—Barn and stabling	John Stewart.....	Sept. 21, 1889	10,500 00
do Superintendent's residence	do	Oct. 21, 1889	1,945 00
St. Paul's Industrial School—Heating and ventilating apparatus	Madden & Bruce.....	July 25, 1889	2,200 00
Stony Mountain Penitentiary—Chaplain's and surgeon's house, heating apparatus.....	Garth & Co.	Nov. 11, 1889	2,400 00
Winnipeg Public Buildings—Supply of coal	Dominion Coal, Coke and Transportation Co	Aug. 19, 1889	1,549 80
do do	North-Western Coal and Navigation Co..	do 26, 1889	1,935 00
do Post Office—Paving and curbing	J. E. Gelley	Nov. 21, 1889	1,595 00
<i>North West Territories.</i>			
Calgary—Guard room for N.W.M. Police.....	Fred. B. Karran.....	Aug. 20, 1889	2,895 00
do Barracks—Incandescent lighting.....	The Calgary Electric Co	Jan. 9, 1890	1,500 00
do Court House—Heating apparatus.....	N. D. McDonald.	April 9, 1890	per annum. 3,261 00
Moosomin—Erection of Court House	Williams & Willoughby	do 8, 1890	9,680 00
Qu'Appelle Immigrant Shed—Alterations to provide Court accommodation and quarters for N.W.M.P.	J. B. Robinson.	Aug. 7, 1890	489 00
Regina Immigrant Shed—Erection.....	J. McCrea.....	July 10, 1889	837 00
do Riding Hall—Whitewashing and painting.....	J. Stewart.....	Aug. 17, 1889	700 00
do Stables for N.W.M. Police.....	J. R. Reilly & Co.....	Sept. 3, 1889	6,717 44
do 2 pairs semi-detached officers' dwellings	W. Henderson.....	Oct. 1, 1889	8,500 00
do Heating and ventilating apparatus for 2 barracks, N.W.M.P.....	J. W. Smith	do 22, 1889	4,000 00
do Government Offices—Erection.....	I. R. Reilly & Co.....	June 17, 1889	8,993 00
do Lieutenant Governors' residence.....	W. Henderson.....	do 18, 1889	5,150 00
<i>British Columbia.</i>			
Victoria—Residence for Officers' Quarters, "C" Battery.....	Woodward & Munday	July 3, 1890	25,500 00
do Officer's Quarters, "C" Battery—Excavating for and laying necessary drains	do ..	June 18, 1890	560 00
HARBOURS AND RIVERS.			
<i>Prince Edward Island.</i>			
Chapel Point—Repairs to and extension of pier.....	E. Maher	March 31, 1890	724 00
China Point—Repairing inner and reconstructing outer end of pier.....	A. Compton.....	Nov. 6, 1889	1,120 00
<i>Nova Scotia.</i>			
Margaree—Extension of and repairs to pier.....	Crowdis & Munro.	Nov. 25, 1889	3,669 00
Port Maitland—Repairs to western breakwater,	A. McKinnon.....	June 24, 1890	5,400 00
Port George—Repairs, &c., to breakwater.....	F. Toms.....	Mar. 3, 1890	9,447 00
<i>New Brunswick.</i>			
Kingston—Wharf and approach thereto.....	Robertson & Robertson	May 29, 1890	3,750 00
Shippegan Gully—Addition to eastern block and construction of pile-breakwater.....	A. Landry.....	Nov. 26, 1889	18,250 00

No 1.—CONTRACTS let by the Department of Public Works, &c.—Continued.

Works	Names of Contractors.	Date of Contract.	Amount.
<i>Quebec and Rivers—Concluded.</i>			\$ cts.
<i>Quebec.</i>			
Extension of pier.	E. Tremblay	May 19, 1889	5,480 00
Isolated block.	Jones & Atkinson	Dec. 14, 1889	16,200 00
Additional length to wharf	A. T. A. Chagnon	Oct. 25, 1889	13,000 00
Isolated pier	E. Toms	Nov. 15, 1889	8,885 00
Isolated pier	E. Dussault	Sept. 2, 1889	9,900 00
Isolated pier and St. Raphael de l'Île Bizard	Two		
	Pompore & Pompore	Oct. 24, 1889	7,200 00
Island of Orleans	do	Feb. 7, 1890	6,000 00
Isolated block of crib work	G. Lavigne	Dec. 20, 1889	4,870 00
Wharf.	T. E. Normand	Nov. 13, 1889	8,525 00
<i>Outlets.</i>			
Isolated pier	Wm. Whitebread	Sept. 26, 1889	2,700 00
Isolated pier	J. Burns	Aug. 21, 1889	3,940 00
Isolated pier	R. Reed	do 19, 1889	21,850 00
Isolated pier	Porter, Reed & Chan	April 2, 1890	0 25
Harbour improvements and dredging	Nicholson & Bates	Dec. 19, 1889	10,730 00
Alterations to works at eastern	Murray & Cleveland	June 18, 1889	8 bid rates
Breakwater	D. Porter	Nov. 8, 1889	6,750 00
<i>North West Territories.</i>			
Highway bridge over Belly River	Gay & McFarquhar	Aug. 26, 1889	30,000 00
<i>British Columbia.</i>			
Isolated pier	Wilson Bros	Aug. 19, 1889	7,150 00
<i>ICEBERG VESSELS AND PLANT.</i>			
Isolated pier	J. Fleming	Feb. 28, 1890	1,425 00
<i>TELEGRAPH LINES SERVICE.</i>			
Isolated pier	P. Flouvy	July 16, 1889	249 00
<i>ST. LAWRENCE LINES.</i>			
Isolated pier	N. T. Hendry's Tel	May 20, 1889	4,275 00
Isolated pier	Grand Works Co	May 20, 1889	1,210 00
Isolated pier	G. F. Rogers	May 20, 1889	1,210 00

F. X. R. SAUCIER.

DEPARTMENT OF PUBLIC WORKS,
OTTAWA, 22nd September, 1890.

No. 2.—STATEMENT of Property purchased or sold by the Department of Public Works during the Fiscal Year ended 30th June, 1890.

Date of Conveyance.	Vendors.	Purchasers.	Description of Property.	For what Purpose.	Area.	Price.
July 12, '80.	John Fox <i>et al.</i>	Her Majesty.	Owen Sound, Lot 5, sub-division of Lot VIII, and north 7 feet of lot 4.	Owen Sound Harbour improvements.	.....	\$ cts. 975 00
Aug. 3, '80.	Her Majesty.	Chas. Robin & Co	Cheticamp Telegraph Line—Right to hang a telephone wire on poles of.	Private use.	.....	1 00 p. annum.
do 6, '80.	E. Broders <i>et al.</i>	Her Majesty.	Owen Sound, Lots 1, 2 and 3, south of Paynter street.	Owen Sound Harbour improvements.	.....	2,750 00
June 3, '80.	Municipal Council of St. Georgeville.	do	Right of way.	For approach to proposed Government wharf.	.....	(Gift.
do 28, '80.	Miss P. C. Cherrier <i>et al.</i>	Her Majesty.	Strip of land	do	.....	do
May 31, '80.	N. W. Navigation Co.	Her Majesty.	Barre, "Fidler River"	Dredging plant.	.....	1,500 00
Oct. 2, '80.	Dr. Preston & W. Pattie.	do	Carlton Place, Ont., piece of land	Site for public building.	60 x 104 ft 6 in.	4,000 00
Nov. 5, '80.	Her Majesty.	Bank of British Columbia.	Nanaimo, permission to lay drain through Government property.	Drainage.	.....	1 00 p. annum.
do 14, '80.	E. W. Hillman <i>et al.</i>	Her Majesty.	Ottawa, half lot on Sussex street	Drainage for Printing Bureau.	.....	810 00
Jan. 21, '90.	Ogilvie David	do	St. Henri, Que., part of lot No. 1925	Site for public building.	.....	3,500 00
Oct. 14, '89.	Estate W. Forter.	do	Owen Sound, piece of land.	Owen Sound Harbour improvements.	.....	1,059 99
Nov. 12, '80.	The Governor and Co. of the Island of Anticosti.	do	Anticosti Island, land occupied by Government telegraph stations and right to cut wood.	Government telegraph service.	.....	2,000 00
March 5, '90.	Malcolm McLean.	do	Walkerton, Ont., parcel of land.	Site for public building.	66 x 165 ft.	1,491 00
Nov. 19, '80.	D. A. McDonald <i>et al.</i>	do	East Bay, C.B., N.S., north side, piece of land.	For approach to wharf.	43 x 84 ft. 6 in. x 63 x 87 ft. 6 in.	1 00
April 2, '90.	Her Majesty.	Dominion phosphate Co. (Ltd.)	Little Rapids, River du Lièvre, permission to erect a landing on part of water lot.	Shipping phosphate.	.....	10 00 p. annum
March 8, '90.	Geo. Armstrong	Her Majesty.	Summersville, N.S.	Approach to pier.	.....	1 00
do 8, '90.	J. Nunn & J. Nunn	do	do	do	.....	1 00
May 19, '90.	Her Majesty.	Estate late H. Judah.	Old Montreal post office property	In final conveyance	.....	13,715 00.

F. X. R. SAUCIER.

DEPARTMENT OF PUBLIC WORKS,
OTTAWA, 22nd September, 1890.

Date of Lease	Lessor	Property Leased	For what purpose	Duration of Lease	Rent Payable per Acre
July 1, 1899	D. J. Walker.	Halifax, N. S., Building Nos. 243, 247, and 249, on Hollis street	Examining warehouse	10 years ..	6 cts
Aug. 20, 1899	Egan Estate Co.	Victoria, Ont., Portion of building next P. O.	do	1 year	1,000 00
do 1, 1899	R. R. Angus & <i>et al.</i>	Regina, Assn., Lots 16, 17, 18, 19 and 20	Court House	2 years	800 00
Nov. 20, 1899	J. Kelly	Almonte, Ont., Parts of lots 1 and 2	Contract works	1 year	1,200 00
do 12, 1899	Her Majesty	W. G. Perley <i>et al.</i>			12 00
	J. R. Beady				
	Estate McKay				
	M. Petrie				
	H. Baldwin	Chaudiere hydraulic lots	Lumber piling and milling grounds	21 years	each lot 100 00
	Bank of Montreal				
	M. Merrill				
	Brownson & Winston				
	Lumber Co.				
	Her Majesty	Seed shipyard	Coal yard and storage for improvement of the River St. Lawrence channel between Montreal and Quebec	3 years	1,600 00
March 27, 1900	D. & J. McCarthy	Grand Mere, River St. Maurice, piece of land	Company's operations	From year to year	20 00
June 17, 1900	Her Majesty	Laurentide Pulp Co.			

DEPARTMENT OF PUBLIC WORKS,
(OTAWA, 22nd September, 1920).

F. X. R. SAUCIER

APPENDIX No. 15.

LIST OF SOME OF THE ACTS OF PARLIAMENT
PASSED AT THE SESSION OF 1890,
AND HAVING REFERENCE TO THE
DEPARTMENT OF PUBLIC WORKS.
OR WORKS UNDER ITS CHARGE

APPENDIX No. 15.

List of some of the Acts passed at the Fourth Session of the Sixth Parliament of Canada, prorogued on the sixteenth day of May, 1890, and having reference to the Public Works, or works under its charge.

Subject.	Full Title of the Statute.	Chapter.	Page in Statute Book.
Sums granted to Her Majesty for the financial year ending 30th June, 1891, and the purposes for which they are granted.	An Act for granting to Her Majesty certain sums of money required for defraying certain expenses of the public service for the financial years ending respectively the 30th June, 1890, and the 30th June, 1891, and for other purposes relating to the public service.	1	3
Interpretation Act.	An Act to amend "The Interpretation Act"	7	55
Disclosure of Official Documents and Information.	An Act to prevent the Disclosure of Official Documents and Information.	10	68
Suppression of lands	An Act to amend "The Exchequer Court Act"	35	220

F. X. R. SAUCIER,

DEPARTMENT OF PUBLIC WORKS,
OTTAWA, 22nd September, 1890.

APPENDIX No. 16.

NATIONAL ART GALLERY.....	xxxvii

CURATOR'S REPORT.



APPENDIX No. 16.

NATIONAL ART GALLERY.—CURATOR'S REPORT.

S. N. 111,574.

DEPARTMENT OF PUBLIC WORKS,
OTTAWA, 19th September, 1890.

SIR—I have the honour to report the following additions to the Gallery, received during the fiscal year ended 30th June, 1890:—

(1) painting, figure subject, ascribed to Schalken, presented by Mrs. Kingsford.

(2) painting, "Hillside Gorge," by Homer Watson, R.C.A.

(3) painting, "Dreaming," by G. A. Reid, R.C.A.

Water color, "A Cascade near Glacier," by F. M. Bell-Smith, R.C.A.

The last named three pictures were purchased by the Royal Canadian Academy and presented to the National Gallery; a sum of \$1,000 having been voted by the House for that purpose.

Diploma design for initial letters, by A. H. Howard, R.C.A., received from the Royal Canadian Academy.

The public interest in the Gallery is shown by the attendance, 18,048 visitors having registered their names during the year, being an increase of nearly 4,000 upon the attendance of the previous year.

I have the honour to be, Sir,

Your obedient servant,

JOHN W. H. WATTS,

Curator.

A. C. HILL, Esq.,

Secretary, Department of Public Works.

APPENDIX No. 17.

OFFICIAL CORRESPONDENCE

FROM 1ST JULY 1867, TO 30TH JUNE, 1890.



APPENDIX No. 17.

OFFICIAL CORRESPONDENCE.

LETTERS Received and Sent from 1st July, 1867, to 30th June, 1890.

Years.				Received.	Sent.
1867	From 1st July to 31st December			2,075	1,511
1868	1st January to 31st December			3,448	2,317
1869	do do			3,448	2,171
1870	do do			4,561	3,145
1871	do do			6,368	3,963
1872	do do			8,333	4,428
1873	do do			10,072	5,797
1874	do do			9,840	5,043
1875	do do			9,006	5,006
1876	do do			7,971	4,773
1877	do do			7,517	4,425
1878	do do			6,886	4,021
1879	do to 6th October			7,186	4,547
1880	1st January to 31st December			7,033	510
1881	1st January do			8,451	4,410
1882	do do			9,569	5,729
1883	do do			10,545	5,690
1884	do do			11,633	6,227
1885	do do			13,114	6,903
1886	do do			8,977	5,321
1887	do do			9,644	5,352
1888	do to 30th June			4,895	2,735
1889	1st July do 1888			10,493	6,343
1890	do do 1889			10,722	7,042
1891	do do 1890			10,088	7,448

NUMBER of Cheques sent by Accountant's to Secretary's Branch and Mailed, from 1882 to 1890.

Year				No.
1882	From 22nd September to 30th June, 1883			1,546
1883	1st July do 1884			3,446
1884	do do do 1885			3,798
1885	do do do 1886			3,446
1886	do do do 1887			4,798
1887	do do do 1888			4,772
1888	do do do 1889			4,843
1889	do do do 1890			4,819

CHEQUES issued by Finance Department and Mailed from Secretary's Branch.

Year.	—	No.
1885.....	From 1st April to 30th June, 1885.....	245
1885.....	do 1st July do 1886.....	954
1886.....	do do do 1887.....	1,158
1887.....	do do do 1888.....	918
1888.....	do do do 1889.....	887
1889.....	do do do 1890.....	908

LETTERS Received and Sent, Chief Architect's Office, from 1st January, 1880, to 30th June, 1890.

Years.	Received.	Sent.
1880—From 1st January to 30th June.....		1,273
1880 do 1st July do 1881.....		2,943
1881 do do do 1882.....		2,859
1882 do do do 1883.....	3,538	4,600
1883 do do do 1884.....	3,860	6,004
1884 do do do 1885.....	4,500	6,718
1885 do do do 1886.....	6,075	6,450
1886 do do do 1887.....	6,816	6,380
1887 do do do 1888.....	6,947	6,870
1888 do do do 1889.....	6,484	7,667
1889 do do do 1890.....	7,448	6,578

LETTERS Sent from Chief Engineer's Office from 10th January, 1880, to 30th June, 1890.

Year.	—	No.
1880.....	From 10th January to 30th June.....	418
1880.....	do 1st July do 1881.....	1,795
1881.....	do do do 1882.....	2,352
1882.....	do do do 1883.....	2,651
1883.....	do do do 1884.....	3,611
1884.....	do do do 1885.....	3,119
1885.....	do do do 1886.....	2,867
1886.....	do do do 1887.....	3,281
1887.....	do do do 1888.....	3,552
1888.....	do do do 1889.....	4,229
1889.....	do do do 1890.....	3,374

NOTE.—The letters, including returns, received in the Chief Engineer's Office may be estimated at the rate of two received to one sent.

APPENDIX.

PART II.

PART II.

REPORT

OF THE

MONTREAL FLOOD COMMISSION,

WITH

INTERIM REPORTS, TABLES, ETC.

REPORT

OF THE

MONTREAL FLOOD COMMISSION.

Vol. 8. — 159

The Commissioners appointed in June, 1886, to ascertain the causes and suggest remedies for the floods at Montreal, entered immediately upon their duties, and after consideration of the large question submitted to them, decided that certain surveys of the river, both in summer and winter, would be required before they could determine the necessity for, and probable effect of, any proposed measures of relief. They found that with the exception of some local surveys in the immediate vicinity of Montreal, there was no knowledge of the winter condition of the river below the river surface, either above or below the city; and in view of the obvious connection between the floods and the quantity, quality and local distribution of the ice, it became imperative to ascertain the extent and character of the submerged ice formation and its source from which it was derived.

These surveys were completed with the close of the following winter, embracing as material the first and only systematic observation of the action of the river during the formation of the ice and the breaking up of the same.

CHARACTER OF THE FLOODS.

The St. Lawrence River is not subject to floods, in the ordinary sense in which the term is applied to other rivers, such as the Ohio and Mississippi. The floods which we have to deal are not due to excessive quantity of water but of ice, and are entirely local, being confined to a comparatively insignificant extent of the river. Although due to ice formation, they differ from ice gorges in the more common rivers which are of short duration and often more destructive, and are occasioned only by the breaking up and departure of the ice. In the St. Lawrence, on the contrary, there is a permanent elevation of the river level in the affected section, while the volume of the flow is diminishing, which elevation though not sustained at maximum height, continues throughout the winter. Although this takes place every winter, and the wharves of Montreal are submerged about four weeks in the year, this winter rise of the river is not always accompanied by what may be called a flood. The river reaches its highest elevation from the packing of the ice in December or January, and its highest spring arising from the breaking up and departure of the ice, in March and April. The spring break up resembles the ice gorges of other rivers, in that it is an accompaniment of the departure of the ice, but this winter elevation is peculiar to the St. Lawrence river, and when it reaches the proportions of a flood, is the result of a unusual burden of ice blocking the channels and requiring a temporary rise before it can force open a larger area of water-way and settle down to its winter bed.

The St. Lawrence is a river of such width and depth that notwithstanding the great volume of water which it carries (its low water discharge above Lake St. Peter being 15,000 cubic feet per second), its extreme range between highest and lowest water level is only about six feet, or one-tenth that of the Ohio at Cincinnati. When this range is exceeded, as at Cornwall, Beauharnois and Montreal it is only in winter, and is due to the packing of the ice. The river below Montreal is affected by ice from the water to the foot of the Lachine Rapids—a distance of eighty miles,

and with the exception of what are called air-holes, the whole surface is covered with ice. But above the Lachine Rapids the winter level is only elevated by ice for a short distance opposite Cornwall and Beauharnois. All the remainder, embracing both open-water river sections and ice-covered lake ones, with rare local exceptions, maintains the ordinary level. The exceptions are where an ice bridge or jam may occur in the narrower channels above the Cornwall Canal in very severe winters, or where a bridge is formed artificially by sawing off enough bordage ice and swinging it across the channel to an island, to give communication with the mainland. These bridges do not affect the river levels at their site, but by arresting floating ice may advance the bridge up stream to a point where shallower water and a swifter current may cause a pack and form a dam. The open-water sections are, about forty miles in length between Cornwall and Prescott, about fifteen miles between Lakes St. Francis and St. Louis, and about ten miles between the ice-covered portion of the latter and the foot of the Lachine Rapids. There is no case of a permanent winter dam where there is open water immediately below it (as in the case of a gorge at the break-up of the ice), but the permanent winter rise at Cornwall and Beauharnois takes place under the same conditions as that at Montreal, viz., the junction of a river section open in winter with one which is closed, and of a strong current with comparatively dead water.

At the outset of the winter there is every reason to believe that ice which has been formed as high up as Prescott reaches Montreal or passes out to sea before the river is boomed by an ice bridge in Lake St. Francis and Lake St. Louis, but when these lakes and the river above Prescott are frozen over the local accumulation of ice at Cornwall, Beauharnois and Montreal is restricted to that which can be supplied from the open-water sections above each. Without these lakes the whole winter output of ice below Prescott would be deposited opposite the Island of Montreal, and in all probability would render a large portion of the lower banks of the St. Lawrence as uninhabitable as Ile Ronde is now, by permanently submerging them during the winter. These lakes generally close permanently in December, they did so in 1886 on the 18th and in 1887 on the 28th, though in both years they had closed at an earlier date and in both the channels had opened again on milder weather setting in.

HISTORY OF THE FLOODS.

There is no record of any gauging of water levels of the St. Lawrence at Montreal previous to 1852. Since that year daily measurements showing the depth of water on the lower sill of Lock No. 1, Lachine Canal (which gives the harbour level at this lock) have been made. The mean summer level of the harbour is taken as a depth of nineteen feet on this sill, ordinary low water seventeen feet, and extreme low water fifteen feet and five inches. The top of the revetment wall or level of Commissioners street is thirty-eight feet six inches above the lock sill, or nineteen feet six inches above mean summer level of the harbour. This wall was completed in 1841, and was no doubt expected to be above all ordinary floods, but its height was evidently limited by that of adjacent streets, Custom House Square, McGill and parts of St. Paul streets. As a matter of fact the water has only gone over it once in the winter months since 1848, namely, in 1886, but has done so seven times in the spring month of April. This April flooding commenced in 1861, and continued at regular intervals of four years until 1873, when there was a cessation for twelve years until 1885, since when it has gone over the wall three years in succession. Many cellars were always flooded, and some portions of the lower streets in many of these years were covered by water backed up through the drains before the river reached the top of the revetment wall, but as this influx of water is limited by the size of these drains and can be cut off and handled by pumps we have assumed the top of the revetment wall as flood level, and count only those as flood years in which the river has overflowed this wall, because when this takes place flooding commences and pumping is out of the question.

Of floods previous to 1852 there is little information extant, as only in the case of one, that of January, 1838, is the height given with reference to any known

elevation. The first winter rise of the St. Lawrence which has been recorded, was at Christmas, 1643, when the first white men wintered here under Maisonneuve. An ice flood then drove this pious soldier out of his cantonments to prayer and pilgrimage, as recorded by Père Barthélémy Vimont, S.J. in the "Relations des Jésuites" (see Appendix).

All the information given by the Royal Commissioners in their report of 29th May, 1841, is that "the greatest flood is about twenty feet above summer level of the harbour; that about 1791 the water covered the whole of the lower part of St. Paul street and that several years after this the lower floors of the Grey Nunnery were inundated to a great depth; that in the winter of 1809-10 timber was floated over Grey Nun street; that in later years the greatest rise was in winter of 1837-38, when the water rose about one foot higher than the present year (1841); that in 1839-40, the water though higher than usual was two feet lower than this year" (1841). The flood of January, 1838, was designated by the *Gazette* of that day as the highest since 1787, and we have been fortunate enough to get the height through a letter published in the *Herald*, February, 1841. The writer says: "Previous to 1838, water never rose over my floor more than one or two inches. The floor is fourteen inches lower than the top of the revetment wall. The water this year came over my floor two and three-fourths feet. I have occupied this store twelve years and have never seen the water rise more than three and a quarter feet above my floor, nor less than three and a quarter feet below it, making the range of winter rise six and a-half feet." According to this writer, who measured from a known level, the flood of 1841 was nineteen inches over the revetment wall and that of 1838, six inches higher, or twenty-five inches over this wall. The Royal Commissioners called it about a foot higher, but gave no data like the occupant of the store at Pointe à Callière.

We may, therefore, take the flood of 1838 as the highest recorded in the first half of this century, or according to the *Gazette* of that day, for half a century before it occurred. That of 1841 was next in height, and the next was in 1848, and they derive greater importance from the fact that they were all winter floods, that is January ones, and that there have been no winters since in which the water went over the revetment wall, until that of January, 1886, an interval of 38 years. The flood of January, 1838, was one foot two inches higher than that of January, 1886. The writer in the *Herald* of February, 1841, states that he was informed that fifty years ago (which would be 1791) there was a winter flood, at the taking of the ice, even greater than that of 1838. There was a January flood in 1818 described by the *Gazette* as an "unusual rise of water at Montreal and Boucherville Islands." Three steamers were torn from their moorings among these islands, two others were moved and injured, and the water stood five feet deep in barns and houses on Gros Bois Island, drowning cattle and sheep. No reference is made to excessive flooding or damage in the city by this flood.

There is no complete file of Montreal papers preserved. Since 1804, which is the earliest to which we have had access, fourteen years are missing. In many years there is no reference to the state of the river. "Griffintown flooded as usual at this season" is a common remark of the newspapers, because the cellars, there at least, were always flooded, as well as many of the streets before they were raised. The great ice-shoves which occurred before the construction of the revetment wall, were fully described, but there is no mention of a flood in connection with these, a fact of importance as showing that the destructive ice-shoves took place while the river was within its banks, and when the ice was confined by the shores, and do not necessarily accompany a high level of water, when the river being out of its banks and the ice no longer confined, moves with the force of the current only, and not under the pressure of a suddenly increased head of water.

In 1819 "Commissioners street was overflowed opposite the new market (the "new market" was on what is now Jacques Cartier Square, and the "old market" on what is now Custom House Square) and planking injured by an ice shove." Commissioners street was then several feet lower than its present level; there is

therefore no mention of a flood in other parts of the city. On 10th April, 1823, there was "the greatest ice shove since 1798." The house occupied by Sharp, in rear of the old mansion house, was blocked by ice to the third storey windows, out of which the inmates escaped. The American mail was stopped by the overflow of the road from Laprairie to St. John's, but there is no reference to a flood of water in the city.

In January, 1833, there were two feet of water in cellars in St. Paul street (the part of the street not mentioned,) canoes were used in St. Anne's suburb and the top of the arch of the bridge over the creek at the foot of McGill street was covered. All this could have taken place without the river reaching as high as the top of the revetment wall. In April following Griffintown was "flooded as usual."

On 25th April, 1836, there was a great ice shove. Handyside distillery at Pointe à Callière was levelled, as well as a stone shed at the mouth of "Little Creek," from which point to Cringan's stores, as what is now the north corner of St. Peter and Common streets, near the foot of Port street. The ice piled thirty feet high. A man named White, his wife and three children were crushed to death in their shanty, upon which ice two feet thick was piled fourteen feet high. The creek overflowed several streets in Griffintown, most probably in consequence of its outlet being dammed up by this great shove of ice. There is no mention of a flood except in Griffintown in connection with this "shove."

Then followed the distressing January floods of 1838, 1840 and 1841, three within four years, in consequence of which a public meeting was held on the 8th January, 1841. A Royal Commission was appointed, consisting of Major Cole and Lieut. Westmacott, of the Royal Engineers, who reported in the following May. A civic committee consisting of Jules Quesnel, Olivier Berthelot, Thomas Phillips, John Redpath and J. Mathewson, was also appointed. This committee reported in March, recommending improvements of certain streets in Griffintown upon condition that the levels of those streets should be established, and advised a stay of further proceedings until after the report of the Royal Commission. On the 9th November, 1841, this committee reported, condemning the report of the Royal Commission, and were unanimous in the opinion "that the only sure mode of relief from the evils arising from an overflow will be to raise the levels of the streets above high water mark" which they fixed (as a minimum) at eighteen inches higher than the top of the revetment wall.

This level would have been that of the flood of 1841, but lower than that of 1838. Since 1841 there have been at least half a dozen floods, varying from two to five and a-half feet higher than the top of this revetment wall.

The Committee recommended that basement stories of houses should be at least one foot higher than the street, which would have given a minimum flood level two feet and a half above revetment wall, and have kept these floors above the flood of 1838, the highest then known to this committee. They said the proposed levels "would be comparatively safe, as only one flood in half a century (that of 1838) would have affected them and that but slightly." A higher level would be advisable if there were not important considerations to be taken into account. They were influenced by the consideration "of the number of houses already built below the proposed level," and the "difficulty in procuring material to raise streets and lots there." They unanimously agreed that, except in special cases, the streets should be raised at the expense of lot owners thereon; and they defended this view on the ground that "individuals have of their own choice purchased low ground at two-thirds less rate than for similar lots not exposed to flood." "Many lots in Griffintown have been required for the ground rent of £3 per annum, equal to a capital of £50, and few of the lots have exceeded double that amount, so that if each individual was to pay £50, or even £100, to raise his lot and half of the street opposite he would still have the advantage over purchasers elsewhere." They advised that the city should raise the principal streets which were thoroughfares connecting one section of the city with another, and those where the grading down on high parts would supply sufficient material to raise the lower portions

of the street. They regretted that the levels of all the streets had not been established long before, because ignorant persons had bought and built on ground liable to be flooded from one to five feet. Brickmaking in Griffintown, they stated, had added to the evil by removing ground already too low, and creating stagnant pits which should be filled up in the interests both of the proprietors and the public.

We have given these details of a report which the then Mayor of Montreal characterized as the "ablest and most valuable report yet presented to the Council," because it presents the difficulties which even then confronted the true remedy for floods at Montreal, viz., the elevation of the low districts; and also to shew how inadequate these recommendations were to provide against subsequent floods. As a consequence of this report, many streets were raised throughout the St. Ann's suburbs, but no attempt was made to bring them even to the level of the revetment wall, there being now ten miles of street below this level, the lowest as much as four feet.

The majority on the high ground were unwilling to be taxed to raise Griffintown above the flood, and unable, apparently, to compel the residents to do so. Could they have foreseen the future commercial importance of the *situation* of this low district, the cost and loss to the whole city by these floods, and the perpetual charge of pumping, which cannot otherwise be avoided, another view might have been taken of the question in 1841. Its consideration now is of importance, chiefly because it is not yet too late to establish a sufficiently high grade for many streets in that portion of the city south of the canal to render the residents there independent of dyke protection.

The Civic Committee then turned their attention to the report of the Royal Commission, which they said "only comprises matters of speculation on the advantages anticipated from the execution of their plan," which plan was "to raise the embankments of the St. Lawrence and its quays, and to turn part of the water behind these through Craig street to Victoria Road, and enter the river at Molson's Brewery." The committee thought the plan "expensive, hazardous, and ineffectual, and the estimates too low." They said the injuries "caused by the rise of the river, which this plan is intended to remedy, are incalculably less than what would be created by its adoption." The committee closed their report in the following words: "Finally, your committee are of opinion that the cheapest and only effectual way of preventing injury from floods is to raise the ground above the height of the flood, and that any expense incurred, or to be incurred, regarding the matter ought not to be defrayed out of the revenue of the city."

The Royal Commission of 1841, proposed to raise embankments three feet above the flood of 1838, which they said would be more than one foot above the "highest flood"; by which they probably referred to the flood of 1791. They proposed to raise the revetment wall, and the bank behind it, to close all connections with the river, and to "draw off the city drains to a lower level." They suggested that, "the heads of the ramps might be closed before the floods, by double stop-gate piers and clay between, but, preferred raising the head of the ramp to the level of the top of the coping." They said the relief which would be afforded by their plan would not be as extensive as they would desire, but it would relieve "all ground floors and streets at the very highest floods, except a few inches on William street and its cross-streets;" they referred in conclusion "to the proposition of an ingenious correspondent," who proposed to exclude the river and pump the land water. They thought a small steam engine might be useful as an auxiliary to their tunnel outlet at Victoria Road, "as it would then only have to cope with the drainage of the Holwell Marsh and of rains, in case of an accident to the tunnel or sluices, or of an unusually small difference of level between the water in the harbour and opposite Victoria Road; and thought the auxiliary engine might even keep the water in St. Ann's Creek low enough to relieve the greater part or even all the cellars in the city, as well as the surface in William Street," and they provided "a sluice gate at the lower end of their tunnel to prevent an inconvenient height of back water, and to allow of the action of the steam engine."

In 1848, the water rose on 4th January, over the revetment wall. McGill street was flooded as high up as College street and Mountain street as high up as Torrance's

Garden. The houses on lower side of Bonaventure street were flooded and the furniture damaged. St. Paul and Commissioners streets were, to a great extent, under water, and remained so until the 19th, five days of a winter flood. This was not of so long duration as in January, 1838, when the inundation lasted fourteen days. Since 1848, the level of floods is known by the gaugings at the canal lock, taken daily, but only at noon and commencing in 1852. Recently a self-registering gauge for floods has been established at the Harbour Commissioner's office, by which the exact time at which highest water is reached, is recorded.

From 1848 until 1861 the water did not reach the top of the revetment wall. The highest spring flood did not come within nearly two feet of it, but in January, 1854, it rose within nine inches, and in January, 1858, within five inches of the top of this wall. In April, 1861, 1865, 1869, 1885, 1886 and 1887, the water went over this wall, and in April, 1873, reached its top level. There was no winter flood between 1848 and 1886, although in January, 1867, the water came within ten inches, and in January, 1858, and also January, 1884, within two inches of the top of the revetment wall. It is remarkable that previous to 1850, all the floods were winter ones, and that this was followed by an exemption for thirty-eight years or until January, 1886, when the next and last winter flood took place; while on the other hand, since 1850 there have been six spring floods, all in the month of April, besides one year in which the water rose in that month to the level of the top of the revetment wall. It is also noteworthy that although the river has reached its highest stage since the gaugings commenced in 1852, eight times in December and three times in March, there never has been a flood in either of these months, nor has the water in either of these months during the eleven years in which the ice took and departed in them reached within two feet of the top of the revetment wall. This proves that the early closing and the early breaking up of winter means immunity from ice floods.

There was no flood between 1848 and 1861, an interval of 13 years, and there was a longer exemption between 1869 and 1885, sixteen years. The rapid succession of floods since 1885 is similar to those which succeeded the flood of 1838, but the agitation which has followed these, unlike that in 1841, has already led to remedial and we believe effective measures of protection. The dyke south of the canal was not carried to full height last year when winter set in.

The highest level which the water has reached at the taking of the ice in the Harbour of Montreal since 1852, was on the 11th of January, 1886, when it stood twelve inches above the revetment wall. The lowest level at which the ice took during the same period of thirty-six years was upon the 6th of January, 1873, when the water stood eleven feet one inch below the top of this wall. This gives a winter range of twelve feet one inch at the taking of the ice during a period of thirty-six years.

The highest flood level on the breaking up of the ice, during the last thirty-five years was on the 18th April, 1886, when the water stood five feet ten inches over the top of the revetment wall; and the lowest level to which the river has risen on the departure of the ice (during the same period) was on the 11th March, 1860, when it was nine feet below the top of this wall. This gives the spring range at the breaking up of the ice for thirty-five years past, fourteen feet ten inches. As already stated there has been only one year in these thirty-five years in which the winter rise was up to, or over the wall, and only seven years in which the spring rise got up to and over this wall.

The Commissioners have obtained the gaugings in the Ottawa River and St. Lawrence, as well as those of Lake Ontario, and also the temperatures of these winters from the McGill College Observatory, in the hope of establishing some relation between these and the flood, as well as the non-flood years, but without much success. While high water in the St. Lawrence and the Ottawa must tensify the April flood, they are unable to say that in any instance it has been the direct cause of one, though April floods have occurred, as might be expected, generally when the St. Lawrence and Ottawa were rising; and the highest flood at Mon-

treval was coincident with the highest level at Ottawa, and also on Lake Ontario on the same date, as was the case during the greatest flood, that of 1886, and no doubt was the cause of its excessive range, but there has been high water at Ottawa when the St. Lawrence broke up at low level at Montreal, and a flood at Montreal when the Ottawa was at an average height only. Nor have we been able to trace any relation between the severity of the winters and the flood years, or the mildness of the winters and the non-flood years, although it is evident that the floods are a question of ice, and they believe of ice only, however much they may be increased by an unusual volume of water in April. High water in the St. Lawrence and Ottawa occurs long after the departure of the ice, and seldom reaches within ten feet of the ice flood level. The river is so large and its banks of such height, that when relieved of ice the greatest known height of water cannot flood Montreal. Even when covered with ice, it is only when this covering conceals a much larger body of other submerged ice as at Montreal, Beauharnois and Cornwall, that flooding is caused by it.

The records of the thermometer for past years, or of high and low stages of the St. Lawrence, are less important for this question than that of the daily condition of the river as to the formation, movement and distribution of the ice which it carries. In order to explain this, it is necessary to describe somewhat minutely the process by which the river disposes of the ice derived from an enormous surface and produced in great abundance, even in mild winters; sometimes in greater abundance in these than in more severe winters, owing to the more frequent breaking up and reforming of the ice over the same surface.

THE ICE PACK.

In the latter part of November, ice formation begins at the shores of the mainland and islands and upon the shoals, which latter are more or less numerous and extensive according to the stage of the river. This "bordage ice" pushes outward as the water becomes colder, and thickens, unless a wind, which in such wide water is always accompanied with more or less sea, breaks off this glacial fringe and sends it down the stream. If the bordage is already strong enough to resist the lighter waves, the latter thicken and strengthen it; and as it widens and encroaches upon the main channel, light, floating ice is drawn under it and there arrested by friction, and cemented by frost to its under surface. When from increasing cold the water of the main channel is cooled down sufficiently (which is generally zero weather), the whole surface of the river is covered with moving ice of a peculiar character, known as "frazil" and "anchor ice." It has a dull leaden hue when afloat, like saturated snow, and floats in patches of varying area, in the interior of some of which there may be unfrozen water like tiny lakelets; in others thin plates or scales of true transparent ice are seen, apparently formed in the calm water produced by the surrounding boom of "slush ice," as this formation is also called; in others may be found ice of bordage origin, from shoals or boulders, which has been swept away by the frazil in its downward march. This might properly be designated "current ice," to distinguish it from that found at the bottom, as it forms only where there is sufficient current or wind agitation to prevent the surface from freezing over. With a certain temperature, the whole unfrozen surface of the river is covered with it, and this condition at the setting in of the winter applies to a continuous open channel between the bordages (wherein is the deepest water and strongest current), from Prescott to tide water, a distance of over 190 miles. From the first appearance of this ice flood until a portion of it is arrested by the closing of the lakes above Montreal, a week or more may elapse; and, since there is an average current velocity between Prescott and Montreal, produced by a fall of over 200 feet in a little over 100 miles, or about two miles per hour, it is quite possible that in many winters ice derived from 100 miles of river may pass Montreal to winter below it.

This abundant and incessant flow of slush ice mingled with more or less of detached bordage ice, and receiving accessions from every part of the open channel both of sheet ice and frazil formed there, is checked and then arrested in the open

channel through Lake St. Peter, where it first feels the effects of tide. Massed across the outlet of this lake, and abutting on the shoals which flank the ship channel there, it is quickly frozen together, and a bridge is formed. Meanwhile the bordage thickened by frost and by snow (made heavier by thaws or occasional rain, as well as the filling up underneath by frazil) begins to encroach upon the water way, causing a gradual rise of the surface. This rise of water lifts the bordages and often detaches them from the shore, when in favourable positions and aided by wind and current, they move down the main channel, until arrested by the ice bridge. After Lake St. Louis has been closed by the severity of the weather and no more floating ice descends from its covered spaces, a thaw may set in, which aided by a north-east wind will break up the ice there from all but the land locked bays and send it in large fields over the Lachine Rapids, where it is more or less broken up. With colder weather the surface is again covered with frazil and thin plate ice, the bordages lifted and broken, and the three kinds of ice move down to the bridge below. It is when the strong floating ice meets this bordage that the winter packing begins, very slight at first in the weaker currents of the lake, but heavier where the current is stronger in the river sections. At the first formation of the bridge the floating cakes are thin and often tilted on edge by the current, projecting vertically and irregularly above and below the surface several feet, also against the edges of the solid bordages, which resist side pressure from the descending flood of ice. The packed surface of the channel presents a ragged section both in air and water. All interstices are filled with frazil, which on the first obstruction is drawn under by the current, but immediately rises to the underside of the ice, where it is soon arrested by the ragged outlines of the ice bridge. This arrested channel ice is quickly frozen together and over it the winter road is formed. The downward flow of ice varies with the supply which is dependent on the weather, and the upward march of the ice bridge is governed by this flow, but not everywhere proportional to it, because more ice is drawn under the bridge where the current is strong and where the ice is thin, and less where the latter is thick or the current weak. With continued cold weather, producing an abundant supply of floating ice, the upward march between Lake St. Peter and Montreal is rapid, averaging four miles per day, until the foot of St. Mary's current is reached. The river in this forty-five miles has an average fall of 1.06 inches per mile, an average channel velocity of two and one-quarter miles per hour in summer. This is increased opposite the city by the Current St. Mary at St. Helen's Island and the Sault Normand, at the reef extending across the river from Moffatt's Island to Point St. Charles, just below the Victoria Bridge. The summer fall in the river from Victoria Bridge to the foot of the Current St. Mary is nine feet in three miles, and the velocity of current four to eight miles an hour.

The upward march of the ice bridge is not only arrested or delayed by mild weather, but there may be gaps in it caused by a jam between the bordages at some point above, forming a temporary bridge there, leaving more or less open water space between it and the permanent one below. This space is generally filled by the giving way of the upper bridge from increasing pressure against it. The downward flow of ice may move at the rate of one and a quarter to two miles per hour, and the upward march of the ice bridge may average one and a half miles per hour at particular times.

Above Varennes (which is twelve miles below Montreal) the packing becomes more severe and the rise of the water greater and this increases from that point to Montreal. In addition to the gradual rise due to the bordages the ice bridge and floating ice, a special and temporary rise or fluctuation of the river level takes place as the ice bridge advances, and within a short time after the ice has taken and the bridge permanently established from point to point the water falls about two feet.

In December, 1886, the ice bridge took at Nicolet in the lower end of Lake St. Peter on the morning of the 4th and reached Stone Island at the head of the lake on the 5th twenty miles in thirty hours; it reached Sorel on the morning of the 6th,

seven miles in fourteen hours, and Verchères, at noon of the 9th, twenty-three miles in seventy-eight hours. Here it was arrested by a five days' thaw and it did not reach Varennes until the 16th, nine miles in seven days. The march to Longue Pointe, seven miles, was made in two days during cold weather. Moderate weather again set in until the 24th and Hochelaga was not reached until the 29th, this four miles of filling up requiring eleven days. It filled up to Moffatt's Island a few hours later on the 29th, and reached Laprairie village on the 30th and the foot of the Lachine Rapids on the 31st.

The rise of water which accompanied the closing of the river in December, 1886, at the respective points, was as follows:

Sorel	4 ft. 2 ins. above low water
Verchères	10 " 2 " "
Varennes	11 " 2 " "
Longue Pointe.....	11 " 5 " "
Hochelaga.....	15 " 9 " "
Lock Sill.....	16 " 11 " "
Laprairie	9 " 9 " "

The water fell gradually during the winter everywhere, except at Laprairie, where it was increased by the winter flow of ice over the Lachine Rapids, and at Sorel, where it rose in consequence of the ice bridge at the Platon; the heights on the 27th March, 1887, were as follows:—

Sorel.....	5 ft. 5 ins. above low water, 16th Sept., 1886.
Lanoraie.....	7 " 1 " " "
Contrecoeur.....	8 " 0 " " "
Verchères.....	8 " 1 " " "
Varennes	8 " 5 " " "
Pointe aux Trem- bles	9 " 0 " " "
Long Pointe.....	9 " 6 " " "
Longueuil	11 " 5 " " "
Laprairie.....	10 " 4 " " "

The winter level of Lake St. Peter ranges from four to five feet higher than low water (eleven feet on the flats) as long as the river below the lake is open. When the river is closed down to the Platon the lake is raised seven to eight feet above low water.

There are no rapids between Hochelaga and Sorel, but there is a nearly uniform rate of fall and velocity of surface current between these points. The effect of the ice pack is seen in the fact that it raised the river at Hochelaga over three and a half times as much as at Sorel. It will thus be seen that the first fifty miles of the upward march of the ice bridge was made in 102 hours (four days and a quarter), while the last twenty-eight miles took twenty-two days. The weather had, no doubt, much to do with this great difference; but it will be observed that while the rate of march between Sorel and Verchères was half a mile per hour, the rate between Varennes and Longue Pointe, though in cold weather, was only one mile in seven hours. It will also be seen that the rise of water, caused by the packing of the ice, was only four feet two inches at Sorel, but at Verchères was ten feet two inches, and at Longue Pointe eleven feet five inches.

The only decided thaw of this winter was that which began on the 9th of December, when the ice bridge's upward march was arrested at Verchères. During the mild weather, between the 18th and 24th, the thermometer ranged from twenty degrees to thirty-four Fahr. This second advent of soft weather set in when the loose ice pack, which is the *avant courier* of the ice bridge, had reached Hochelaga and delayed the extension of the bridge up to that point until the 29th. The ice bridge was formed at Hochelaga on the 29th, and the highest water of this winter registered in Montreal Harbour was reached on the same day at 3.30 a.m., but this did not exceed the average winter high water mark, and was four feet seven inches below the top of the revetment wall. When the ice

bridge had reached the Lachine Rapids, two days later, on the 31st December, the level of the water in the harbour had fallen one foot, and from this out it fell slowly until 5th February, when it reached the lowest level of the winter, eleven feet seven inches below the top of the revetment wall.

The Laprairie basin is a shallow lake with a strong current through its channel, extending from the Lachine Rapids to the Victoria Bridge. Its ordinary level, previous to the setting in of winter, is about ten feet above that of the Montreal Harbour. The advancing ice bridge, raising the whole river, floods out St. Mary's current and the Sault Normand, and raises the level of this basin more or less every winter before it is covered with ice, which covering is effected, nearly always, by the filling up of the channel surface between the bordages with running ice which has come over the Lachine Rapids. The high water of the 29th was the last stroke of the great hydraulic ram which fixed the ice bridge at Hochelaga, making a comparative mill pond of the river surface thence to the Lachine Rapids, without sufficient current to carry the strong floating ice under it, so that the basin filled up rapidly and the winter shove was over.

It is when the ice bridge approaches the St. Mary's current, and this rapid is apparently fighting for its life, that the grandest effects of its convulsive efforts are seen. The large floes, as they approach the ice bridge, are nipped between it and the moving ice behind them and are broken, tilted on edge, forced under the bridge or packed against it. When this moving mass is excessive it grounds on the shoals and piles in the channel, thus throttling the only water ways left to the river, the latter then rises rapidly, backing up to deliver an effective blow and drives the obstruction before it, and on to the bordages or under them, out of the channel. Sometimes the solid bordages are lifted, cracked and the edges driven over each other or on the shore, where piles of great height and volume are suddenly formed, sweeping everything movable before them.

These great movements, the last efforts of the river before going into winter quarters, take place when the hard winter weather has set in, and often when the supply of field ice is at a minimum. Lake St. Louis closed for the first time on the 6th of January, opened on the 9th and closed finally upon the 18th. The ice which went out of it in this interval assisted to fill up the channel between Verchères and Hochelaga. In addition to that which went out by the reopening of the channel caused by the thaw between the 9th and 16th, a strong west wind blowing on the 17th broke off the bordage rapidly and in the afternoon of that day the river opposite Lachine was covered with floating ice. No doubt more or less bordage ice came down from this Lake after it was closed the second time; and perhaps more from the bordages in the Laprairie Basin where the channel was still open, and the mileage of exposed bordage much greater than at Lake St. Louis, but very cold weather set in on the 27th, before the ice bridge was formed at Hochelaga and continued until the 6th January. During this time the ice field at Lake St. Louis was extended downward, and the bordages of the Laprairie Basin outward into the open channel. On the day that Lake St. Louis closed for the second time (the 18th) the river was running full of frazil. On the 21st very little frazil was to be seen in the open water. On the 23rd the same conditions existed opposite Montreal and Lachine. On the 25th a very great quantity of frazil was passing the city, greater than had been previously observed, and it was not, as in the case of the earlier formations, spread out in flat and thin areas, but massed in solid looking floes, some of great extent which were coated with ice an inch or more in thickness. It was the arrival of this new comer in such vast quantities, which, in the absence of diminished supply of bordage ice completed the ice bridge at Hochelaga and formed those submerged "wing dams" of ice suspended from the lower side of the ice bridge, like inverted shoals, thus raising the river to its maximum winter elevation.

These collections of frazil are the most important factor of the flood question, and, indeed, it may safely be asserted that they are the sole cause of them. In other words, if there were only field or bordage ice to deal with, no matter how often they were broken up or broken off by wind or thaw, there would be no floods, because it

is inconceivable that in a river over a mile in width with a channel half a mile wide and thirty feet deep, enough of this ice could be sunk to raise the water to such an extent, as to produce a flood. The tendency of field or bordage ice is to float, and it resists submersion with great force, while the tendency of frazil and anchor ice is to sink upon the slightest provocation, and follow submerged channels, taking all the windings of the currents until grounded in shallow water or arrested against the underside of the fixed ice to which it freezes and forms a nucleus for further accretions of the same material until this spongy downward growth reaches many times the thickness of the surface ice to which it is attached. This material exercises such an important influence upon the winter conditions of the St. Lawrence that it is necessary to describe its origin at the surface, growth on the bottom, and rising to the surface in a succession of "crops," repeated at more or less frequent intervals, according to the intensity of the cold.

ANCHOR ICE.

The terms "anchor ice," and "frazil" (cinder ice) are indifferently applied to the same material, but the first evidently is most applicable to this ice when found in the bottom of the river. Large quantities are formed by a comparatively moderate degree of cold upon the surface of the open water, and never reach the bottom, but a still larger quantity in the same area and with much greater rapidity becomes attached to the bottom in the coldest weather only and leaves it on the approach of a higher temperature. In one respect the two are identical, that is both are exclusively the production of open water. There is no formation of either when and where the surface is covered with ice, and whereas large formations of both take place in the beginning of winter over the vast surface below the Lachine Rapids, the further formation of this ice ceases as soon as and wherever the ice bridges are formed. Frazil, as distinguished from anchor ice, is formed over the whole unfrozen surface above and below Lachine Rapids between Prescott and tide water, and wherever there is sufficient current or wind agitation to prevent the formation of bordage ice, while anchor or anchored ice, except in the shallowest portions of the current, does not appear in the deeper water until zero weather sets in.

This continued low temperature brings the whole body of the water to or even below the freezing point, and it is then filled with needles of ice which are carried from the surface to the bottom and from the bottom to the surface by the rolling motion of the descending water. The contact of this frigid current with the bottom brings the latter into a condition when this form of ice adheres to and commences to grow rapidly upon it, as an icy fungus or moss attaining a growth of several feet in depth within the duration of a severe cold term which may extend from three to five days. On the approach of mild weather it becomes detached from the bottom, sometimes bringing up with it gravel and stones, and may be seen a dark coloured mass bursting up all over the open surface with considerable force and with a hissing sound, which rises a foot or more above the surface but falling back shows only a few inches floating above it. Out of the portion above the surface, the water quickly drains and it becomes as white as snow. The river surface then presents the appearance of a meadow dotted with low white hay cocks, which pass over the Lachine Rapids and go under the fixed ice below. This is repeated several times during the winter, the number of the "crops" and the thickness of each depending on the severity of the winter.

One of the principal objects of our survey has been to ascertain what became of this anchor ice as well as of the surface-formed frazil after they disappeared under the ice bridge. Holes were cut through the ice in March last and lines of cross sections, over fifty in number, were taken at various points between Lake St. Peter and the Lachine Rapids. Through these holes the thickness of solid ice and of frazil, as well as the depth of water underneath both, were ascertained. The frazil, or anchor ice, was always found immediately underneath the solid ice and attached to its under-side. Chopping was always necessary to get through the solid ice but as soon as the frazil

was reached the water came up to its winter level. A pole could be forced through the frazil and a heavy sounding weight could be "churned" through it until the clear water was reached, or the bed of the river, where, as in some cases, this deposit extended to the bottom. The first trial cross-sections showed that the deposit of frazil was comparatively small in quantity below Varennes. The cross-sections, therefore, were taken chiefly above Varennes, and more frequently where the greater deposit was found. The great bulk of the frazil was found above Longue Pointe, and above that point, therefore, the great majority of the cross-sections were taken. The greatest quantity in proportion to the free water was found in the Laprairie Basin. Here there was more frazil than clear water, the proportions being one hundred and seventy millions of cubic yards of frazil to one hundred and thirty millions of cubic yards of water. The next greatest quantity was found between Ile Ronde and Longue Pointe, where there was about half as much frazil as clear water, the proportion being forty-five millions of cubic yards of frazil to ninety-one millions of water. The next most congested section of the river was that between the Victoria Bridge and Ile Ronde, where there was found about thirty per cent. of frazil. The next in order of congestion was between Longue Pointe and Pointe aux Trembles, where the frazil was about twenty seven per cent. of the clear water. The last section measured was between Pointe aux Trembles and Varennes, where the frazil was reduced to a little over six per cent. of the clear water.

These proportions of ice and water are confined to the frazil alone and do not include the solid ice covering of the river, which weighed down by snow, thaw and rain, is thereby depressed below winter water level, and by so much encroaches on the discharge at its widest point. In these comparative quantities no account is taken of the water with which the frazil is saturated, when suspended in the channel and underlaid with clear water. When grounded and compressed by the weight of the solid ice overhead, little water can penetrate it and this grounding is shown by "hummocks" on the river surface where the frazil is holding up the crust when elsewhere it has been lowered by the falling of the water.

The greatest depth of frazil below Montreal was found immediately opposite Longue Point. Here the downward growth from the underside of the solid ice covering of the river extended to a depth of thirty-five feet. It was found nearly as deep at the foot of the Lachine Rapids. In these cases it reaches nearly to the bottom, but of course not all the way across the channel, otherwise the river would be driven out of its banks. Opposite this great "undergrowth" at Longue Pointe the main channel is about sixty feet deep overhung with about twenty feet of frazil, but having a clear water way under it nearly forty feet deep, through which it finds relief. That this downward growth of frazil is, in the situations most favourable for its accommodation, only limited by the depth of water, seems probable from the results of our soundings above Beauharnois where the enormous winter run of frazil between Lake St. Francis and Lake St. Louis, is arrested as soon as the latter is permanently closed. Here we found the undergrowth over eighty feet deep and reaching within a few feet of the bottom.

This frazil, though porous and saturated with water, is as effective an obstruction to the flow of the river with respect to the area occupied by it, as so much rock, and offers a more ragged outline than any other portion of the wetted perimeter. The obstruction it creates may be inferred from the fact that it compels so great a river as the St. Lawrence to back up in winter fifteen feet at Hochelaga before it can force sufficient way for its low water discharge through these miles of monstrous tubercular growth within its ice-covered bosom.

On the basis of our cross-sections, the estimated quantity of frazil between the Lachine Rapids and Varennes, in March last, was two hundred and fifty-three millions cubic yards. Besides this frazil there were one hundred millions of cubic yards of surface ice between the Lachine Rapids and Varennes, making a total of ice in this section exceeding three hundred and fifty millions of cubic yards. Of this amount two hundred and twenty millions were above the line between Moffatt's Island and Windmill Point, but as the ice went partially out of Laprairie Basin

before the flood and shoved in front of the city, about half of this two hundred and twenty millions of cubic yards must have slipped down below Ile Ronde before the ice bridge gave way, and thus contributed to the flood of April last. We have no previous measurements with which we can compare those of March last. The quantities of March, 1887, were probably in excess of average winters; but our investigation of temperature shows as severe winters not followed by flood. There may have been as great, or even greater, quantities of frazil in some non-flood years, when it was differently distributed, or when it moved off in different order.

We endeavoured to ascertain whether there was any diminution of this body of frazil, before the ice went out, for which purpose it was remeasured up to the last day on which it could be safely done. Warmer land water is coming in, it may be weeks before the ice goes out, but apparently it had no effect upon the frazil or upon the channel water which maintained a temperature almost at the freezing point to the last.

Thus there was in April last, during the flood, about three hundred millions of cubic yards of ice, massed in that portion of the river extending from Montreal to Varennes, forcing the river to rise over nine feet higher than when the ice bridge formed at Hochelaga in the end of December, 1886. Probably one-third of this total had been let down below St. Helen's Island from that portion of the river between it and the Lachine Rapids, which contained over two hundred millions of cubic yards of ice. This was an obstruction compared with which St. Helen's Island, Ile Ronde and Moffatt's Island are insignificant. The whole cubical contents of these islands above low water mark is under twelve millions of cubic yards.

This ice obstruction causes the river to rise until its increased sectional area and additional head give the necessary discharge; and whereas, the river when not burdened with ice, varies its sectional area, surface slope and velocity, as it narrows or widens, shoals or deepens, we find that when congested with ice, with all lengths of cross-sections, and all depths of frazil there was remarkable uniformity in the area of the free water-way left, everywhere between Lachine Rapids and Varennes. The river evidently disposes of the down-coming frazil where it will be least in the way. A very large proportion of that we found in March, perhaps the greater portion, had been carried down there after the ice bridge was formed. All through the winter we found from observations at the air-holes, that frazil was passing down below the city. This undoubtedly had come over the Lachine Rapids and had gone through the whole length of the Laprairie Basin. How far it travels from Montreal we cannot determine. It probably follows the main channel current until it is wheeled out of line by some eddy or counter current and is thrown into slower water where it will be allowed time enough to attach itself to the ice overhead. There is no means of getting current velocities under the frazil, but the presumption is that when this encroaches upon the channel to a certain extent the local current is quickened and no more frazil allowed to stop there. In whatever way it is done the cross-sections prove that the river, like a judicious stevedore, disposes of the frazil as it arrives and so places it as to maintain a thoroughfare for its water.

A diagram profile has been constructed from these cross-sections, which shows this uniformity of water-way. Upon it every one hundred thousand square feet of area of water and frazil separately is represented by an inch vertical. It shows that while there is ten times as much frazil at some of the cross-sections as at others, there is but little difference in the area of water-way. There was less frazil found in the main channel opposite St. Helen's Island and Isle Ronde, than in any other place above Longue Pointe. In March, 1883, a cross-section was taken in the St. Lambert channel opposite St. Helen's Island, which showed more than four times as much frazil in the same place as in 1887, and a water-way only three-fifths of that of last year, but as St. Mary's current showed, as usual, but little frazil, there was no flood in 1883, the highest water in April being five feet ten inches below the top of the revetment wall. The winter of 1882-1883 was very similar to that of 1886-1887.

Uniformity of water section suggests uniformity of current during this state of ice congestion, which we know does not exist when the river is free from ice. The

summer current opposite Montreal is much stronger than it is in the Laprairie Basin, above or in the river below Hochelaga. The one is reduced and the other increased by the ice pack, and it is owing to this increase of current in Laprairie Basin chiefly, that so much frazil is carried down below Montreal, and so far below that city.

The sources from which this enormous amount of frazil is derived, are first the whole river above Montreal until Lake St. Louis is closed, then the river section below this lake as far as Laprairie Basin with its twenty-nine square miles of water surface, nineteen square miles of which remained open until the ice pack from below ascended to the Victoria Bridge. After this space is filled up with ice, the open area from the foot of the Lachine Rapids to Lake St. Louis above Ile Dorval, containing about twelve square miles remains open all winter. Lake St. Francis is permanently closed in December, but the fifteen square miles of open water between it and Lake St. Louis, sends down the frazil in such quantities that the channel opposite Beauharnois is blocked, raising the water about thirteen feet, the flow of the Ottawa River on the Vaudreuil side of Ile Perrot is stopped, the current reversed and large quantities of St. Lawrence water pour into the Lake of Two Mountains, some of which flows down the Back River, (the main stream of the Ottawa) and re-enters the St. Lawrence at Bout de L'Ile, fifteen miles below Montreal.

INTERIM REPORTS, 1886.

Since their appointment in June, 1886, the Commissioners have made five interim reports, two in 1886, and three in 1887, which will be found in the appendix.

On the 31st July, 1886, the Commissioners reported that immediately after their organization they had taken up the question of the protection of the district south of the Lachine Canal, and had made surveys and estimates for a dyke for this purpose, and stated that "they thought it probable that it would be decided to construct this dyke because of its simplicity, certainty and moderate cost, and also because any alternative scheme would involve delay, and, therefore, exposure to another flood"; they also reported that nothing could be done to protect the remainder of the city before the following winter.

On the 28th October, the Commissioners recommended as the only precaution available against a flood in the coming winter, an experiment with a view to keeping open the channel below Montreal until Lake St. Louis becomes permanently closed, and as much longer as would be necessary in order to get rid of a sufficient portion of the running ice which winters below Montreal. This recommendation was adopted after some delay, but the river closing unusually early in December at Sorel, where the boats were frozen in, the attempt to carry out the experiment could not be made. The Commissioners are of opinion that in view of its small cost this experiment should yet be made. They have in their report of October of 1886, fully given their reasons, and would only add that although no longer an urgent question, for the protection of Montreal, the result of the experiment would be most important to other exposed localities which have not the same ability to protect themselves as that city.

The river closed wholly in December, 1886, and as in all previous occasions of such an early closing, without a flood. The winter was long and severe, and much anxiety arose about the prospects of an April flood. The only effort possible in mitigation of this was another experiment—the breaking of the ice below the city by means of explosives. It was observed during the flood of the previous April that after the shove which caused the flood, the shoved ice was held against a bridge of the unmoved winter ice near Longue Pointe, and preparations were then made to break this bridge with dynamite, but when this was about to be applied the bridge gave away and the flood was over.

In March, 1887, two lines of holes were made, 1,000 feet apart, in the main channel, commencing at a long air-hole below Pointe aux Trembles and near Isle Ste. Thérèse. The holes on each side were one hundred and fifty feet apart,

below Longue Pointe, and one hundred feet apart above that place, and diagonal lines were run across the channel every half-mile. The length of channel blasted was about seven miles, extending up stream to a point one mile above where the shoved ice was held the previous year. The depth of snow over the solid ice was such that it was not possible to determine the full effect of the blast which was fired about ten feet below the water surface. The effect of the blast was no doubt much diminished by the great depth of frazil under the ice, which prevented the transmission of the blow as effectively as if in clear water.

After several trials it was found that the depth of ten feet was most effective, and at distances of one hundred to one hundred and fifty feet between the holes, sufficiently close to break the ice between them. Different explosives were tried, and the charge of five pounds of dualine was proved to be the most effective. The work was commenced on the 14th March, as late as it was safe to delay it, and completed before the spring break up of the ice. It was hoped that some assistance in weakening the ice bridge would be derived from the weather as the spring advanced, but it continued very cold and there was no apparent change in the channel as the result of the blasting. All that was hoped for in this experiment was that the shove would be extended further down the river, and by being spread over a greater distance diminish the rise of the water behind it. The shove came in April and extended down into the blasted section four thousand feet, but whether our work had any effect in reducing the flood that followed the shove it is impossible to say. The flood was a very severe one, though not as severe as that of April, 1886, when the water rose one foot two and a half inches higher.

In Captain Austin's Arctic expedition of 1851, his ship was frozen in near Griffith's Island and a channel was cut out with powder to release him. He reports that "sixteen pounds of powder lowered ten feet below ice five feet thick, broke up a space of four hundred yards square." Nothing approaching this could be done with an equivalent charge of dualine in the St. Lawrence, the ice was not any thicker, but it had twenty or thirty feet of frazil hanging to it, and this no doubt explains the different results.

Four thousand six hundred pounds of dualine were used, eight hundred holes were cut through the ice, the cost per hole (half labour and half explosives) was three dollars and six cents, and the total cost of this experiment was \$2,452.67, the only benefit derived from which is, that it has settled the question of the value of explosives among the frazil deposits, as a means of preventing floods wherever (as was in the case here) there is no means of getting rid of the loosened ice.

THE BREAKING UP OF THE ICE IN 1887.

With the rise of the temperature in the spring air-holes, which had been closed, reopened, and the opened ones were enlarged. The water began to rise and appeared along the river edge above the ice, while the latter was still attached by frost to the shore. On the 3rd April, bordage ice came out of bays in the Lachine Rapids, on the 12th the Longueuil Road was stopped by an opening in the ice on the Hochelaga side, while the ice road beyond was still good. On the 14th open water extended down from the channel, north of Heron Island, in the Lachine Rapids, to the outlet of the tail race of the Montreal Water Works, and a channel extended to a point east of Nun's Island. A narrow tongue of open water also extended from the foot of main rapid, down into Laprairie Basin. Air holes appeared in Laprairie Bay, and those at Victoria Bridge became enlarged. On the 18th open water in the channel west of Nun's Island extended down to Victoria Bridge. Teams were still crossing from Montreal to St. Lambert. On the 19th a slight shove took place in the forenoon in the Laprairie Basin, producing an angle in the road to Laprairie. In the afternoon at 3 p.m. the first general shove took place. A crack appeared on a line from Ile Ronde along the shore of St. Helen's Island, towards centre span of Victoria Bridge, and extending upwards into the basin above.

The ice on the Montreal side only moved down one hundred and fifty feet, and against St. Helen's at its head, and as far down as Ile Ronde, the open water

extended from the west abutment of Victoria Bridge to Wind Mill Point, also along the wharves at the upper end of the harbour. There was an open space one hundred yards wide below Victoria Pier, and another at the foot of St. Mary's current in front of the wharves near the jail. The ice in the St. Lambert Channel and below Ile Ronde remained unmoved. On the 20th a heavy shove took place early in the afternoon along the east shore of Laprairie Basin, piling the ice eight feet high upon the land road. The water in the harbour rose one and a half inches with the shove.

On the 21st April, the ice in Laprairie Basin was generally shoved and fractured. Heavy shoves again occurred on the east shore, but these caused no rise of water in Montreal Harbour. Ice in St. Lambert Channel and below Ile Ronde still unchanged. The open space between the west abutment of Victoria Bridge and Wind Mill Point, extending out to a line joining the outer end of the abutment and the lower corner of the wharf was filled with floating ice.

Between 3 and 5 p.m. a general and heavy shove occurred, the water rose in the harbour one foot, and then fell eighteen inches within an hour. The line of this shove was marked by St. Lambert wharf, head of Moffatt's Island and from thence along the shores of St. Helen's and Ile Ronde straight down the river as far as about five hundred feet below the Hudson Cotton Factory, there turning west to Montreal shore, and closing the open spaces on that side. Over the whole area between this line of fracture and the Montreal side, all the ice was crumpled up and packed. Spaces in Laprairie Basin opened and quickly closed again. Heavy shoves for the third time on the east shore of this basin took place, but the channel west of Nun's Island remained open to the bridge.

Up to this time there was no general movement of the ice in Lake St. Louis, Lake St. Francis or Lake of Two Mountains, but on the forenoon of the 21st two square miles of ice came down from Lake St. Louis, other portions were seen breaking off the lower fringe of the ice field in that lake, and about three square miles may have left it and passed down before the flood occurred at Montreal. But as Laprairie Basin was not yet open, this ice would be arrested there.

At Longue Pointe the holes along the west line of the blasted channel were opened on the 20th and 21st, and a rapid current ran through them. A large air-hole near Charon's Island at the head of the Boucherville Islands, showed the ice to be weak in that direction.

At 2 a.m. on the 22nd of April, the water rose suddenly three and a half feet by the self-registering gauge at the harbour office, and only receded six inches before the principal shove of the season took place which was at 6 a.m.

The ice upon the whole surface of the river opposite Montreal as far down as a line starting two and a quarter miles above Longue Pointe on the west shore and running across to the east shore a little below Longueuil village, broke up, jammed and packed, extending four thousand feet into the blasted channel.

The unbroken ice was pushed bodily down the river, and immense masses of it were piled upon the Boucherville Islands and upon both shores. Open water extended from Victoria Bridge downward, coming to a point at the end of St. Lambert wharf. Five spans at the east end of the bridge showed open water, but the intermediate fifteen spaces were heavily blocked and almost without current; below some of the spans there were eddies and reverse currents, showing that the ice extended to the bottom and dammed them off. There was much open water as well as large fields of ice in Laprairie Basin, but the wide bordage in the south-east portion of Laprairie Bay remained *in situ* and extended nearly down to the bridge. Large areas of unmoved ice extended downward from Ile Heron and upwards from Nun's Island, no doubt fastened to the bottom. Before 7 a.m. of the 22nd the water which hitherto had not risen within a foot of the top of the revetment wall, or flood level, rose five feet five inches in one hour and twenty minutes (sixty-five inches in eighty minutes), going four feet over the revetment wall. Twelve hours later, at 7 p.m., it reached its highest point, which was six inches more, and one foot two and a half inches lower than the greatest flood, that of April, 1886. It remained over the revetment wall four days and nineteen

hours, or one day and fifteen hours longer than the flood of 1886. At 10 a.m. of this day the ice shoved on the east abutment of the Victoria Bridge, sliding up the masonry above the highest coping, and striking the telegraph wires, at a point about 70 feet above low water mark.

At 8.30 a.m. on the 24th the ice shoved in the St. Lambert Channel for some distance down from the St. Lambert wharf, but soon stopped and did not bring away the jam at Victoria Bridge. At 3.40 p.m., on the 24th, the next great movement began; up to this time the water had not risen very high at Longueuil, although it was one foot six inches deep on the floor of the pump house there, or twenty feet above low water. Heavy shoving had taken place opposite the village, and along the low shore above up to the Government House at the point. This now gave away, and all along the river poured in over the low lands down into the village, carrying huge blocks of ice, which dealt destruction to houses, telegraph poles, fences, &c. The water rose at the pump house five feet in ten minutes. St. Lambert's Channel was open at 5 p.m. from Laprairie Basin down to the Government House above Longueuil.

There was a shove the same day down St. Mary's current, and down the west line of blasting to Elmwood Grove, and from thence across to the head of the Boucherville Islands; but it only caused about six inches fluctuation at the harbour gauge.

On the morning of the 25th April, the ice was still fast at the central spans of the Victoria Bridge, and no material change had taken place elsewhere opposite Montreal from the conditions existing on the previous day, but about 10 a.m. a movement began in Lake St. Louis. Fields of ice descended from that lake, the head of the column passing Lachine at 11 a.m., and reaching Victoria Bridge at 4.30 p.m. This flow ceased before the morning of the 26th, and no effect was produced by it upon the level of the water in the harbour of Montreal, nor at St. Lambert's although this ice flowed through that channel and disappeared under the bridge below.

In the afternoon of the 26th the ice, which had been so long jammed at Victoria Bridge, passed out quietly. The open water on the Montreal side, which had been extending slowly downward since the shove of the 24th, had now reached Ile Ronde, on one side, and Longueuil, on the opposite shore. At 10.15 a.m. on the 27th, the second detachment from Lake St. Louis appeared at Victoria Bridge, flowed all through the day, but ceased some time during the night.

At 11 a.m., on the same day, the ice began to move at Longue Point, but blocked below the church at 1.30 p.m.

At 1 p.m. the water had receded to the level of the revetment wall in Montreal harbour, and the flood was over.

On the 28th the open water was extending rapidly from St. Lambert diagonally towards Longue Pointe, and at 4 p.m. the ice at the latter place began its last movement, and on the 29th the river was cleared.

LAKE ST. LOUIS.

Between the 10th and 13th April, the water had risen two feet at St. Anne's and Lachine, and on the 13th a floe about one hundred feet by one hundred and fifty feet broke away from the field above Dorval, and damaged a construction crib at the Lachine bridge. On the 15th, the ice was honey-combed for one-third its depth from the upper surface, and worn on its underside by increasing warmer currents.

On the 19th April, the current at Vaudreuil Railway Bridge, which had been flowing northward since the 14th January, and carrying St. Lawrence water into the Ottawa, ceased, and reversed, running southward bringing Ottawa water into the St. Lawrence again. Between the 15th and 19th a small quantity of St. Lawrence ice flowed northward through this channel, until it was stopped by the ice-field in the Lake of Two Mountains.

On the 21st about two square miles of ice, in about equal proportions from both sides above Dorval, went out from Lake St. Louis. No frazil was observed at Lachine Bridge for some days before the 22nd, but on that day floes

eight to ten feet across passed down. Very little ice passed out of the Ottawa at St. Anne's and Vaudreuil until the 26th.

On the 25th fifteen square miles of ice started in Lake St. Louis, jamming and shoving between Dorval and Chateaugay Point, and held there until next morning, when it descended, striking the railway wharf at Lachine, and swinging round the ice breaker at the pier-head of the canal entrance, was jammed between it and the Caughnawaga shore, broken up and shoved.

This ice was weak, worn through in places, and had not rigidity enough to ride up on the cut-waters of the Lachine Bridge piers.

LAKE ST. FRANCIS.

On the 10th April, the water rose at Coteau Landing two and a quarter feet, but began falling immediately. Teams were crossing the lake higher up until the 19th.

On the 22nd the lake channel opened down from its upper end as far as Port Louis. On the 23rd the ice began to move out, but was so far weakened that the railway ferry steamer at Coteau ploughed through the passing fields.

On the 25th the lake channel was open from Cornwall to Coteau Landing, but the ice in bays remained until 2nd May, when the lake was cleared.

LAKE OF TWO MOUNTAINS.

Between the 1st and 26th April, the water rose in the lake five feet three inches, and then the ice began to go out. It remained steady at this level until the 4th May, when the north water came down, and on the 14th May it had risen two feet more, making the total rise seven feet three inches.

The flow of ice out of this lake from the 26th to 29th was considerable, but intermittent until the latter date, when the remaining ice began to go out, and the lake was clear on the 30th April.

TIDE WATER SECTION.

The section of river below Lake St. Peter is always open before that lake, being assisted in breaking up by tidal action. During the winter of 1885-1886 it was not closed at all, but in 1886-1887, with the exception of some open spaces, it was covered with ice and air-holes down to the Platon, thirty-five miles above Quebec. As the ice here plays no part in the flood question at Montreal, it is only necessary to say that in April, 1887, it gave way at Three Rivers on the 18th, at Leclercville on the 22nd, at Cap à la Roche on the 23rd, and at the Platon on the 24th, and was all out of the way four or five days before the flood was over at Montreal.

The opening of this section is interesting chiefly for comparison with those above Montreal. The ice which affects Montreal in spring extends from twelve miles below the city to the head of Lake St. Louis, about twenty-five miles above it. There was not much difference in time in the commencement of the breaking up at the different points from Cornwall down to the Platon. The first shove took place at Three Rivers on the 18th, and on the same day in Laprairie Basin. The first opening was at Three Rivers on the 18th, at Leclercville on the 22nd, on Lake St. Francis and at Cap à la Roche on the 23rd, in Lake St. Louis and at the Platon on the 24th, and in the Lake of Two Mountains on the 29th.

The main shove which caused the flood at Montreal took place on the 22nd, but the ice held at Longue Pointe until the 28th.

Thus the breaking up of the ice extended over a period of about ten days.

INTERIM REPORTS, 1887.

On the 5th May, 1887, the Commissioners reported the completion of their river surveys, and for reasons set forth in that report recommended a temporary dyke for that portion of the city north of the Lachine Canal. This recommendation was the result of their observations during the flood of the previous month. In all

preceeding years of floods the lake ice was supposed to have come down before the flood occurred, and the belief was general that this ice was the direct cause of the floods, but in April last, the shove which caused the flood took place before any lake ice had passed Montreal. Had the result being otherwise, the Commissioners, might, in view of the difficulties surrounding the question of a dyke north of the Lachine Canal, have recommended works for holding back the lake ice as a first step, and the postponement of other measures until the effect of these had been ascertained.

On the 12th August, 1887, the Commissioners, on the request of the Minister of Public Works, reported on the question of holding back the ice in Lake St. Louis by means of piers and booms below Isle Dorval, which they believed to be practicable at moderate expense. They have nothing to add to the reasons given in that report, except to draw attention to the fact that these piers and booms should, if as effectual they believe they would be, not only prevent the lake ice from coming down in the spring before the river was clear below Montreal, and until the ice everywhere becomes very weak, but that their effect would be to greatly diminish the absolute amount of the ice which is now brought down from above the line proposed for these piers and booms at the beginning of, as well as through, the winter. Before this lake is closed at all large quantities of frazil pass through it, and large quantities of borage ice are broken off by wind. Again, after this lake has taken it frequently opens again sending its ice below, thus exposing a large field for the manufacture of frazil a second time. All of this ice descends below Montreal and adds to the ice pack there. The question may be raised, as to whether these piers and booms would increase the ice pack opposite Beauharnois. The proposed line of piers is eleven miles distant from the ice bridge opposite Beauharnois. The main channel through the lake is one mile wide and 25 feet deep. The current in this is too weak to drive the frazil under the ice and we believe it is arrested by friction under the lake ice and frozen to it as soon as the increased current caused by the head of water due to the jam at Beauharnois has extended its force below that jam. Frazil was not observed coming out from under the lower edge of the ice-field in Lake St. Louis. If it could go through the lake there should be no jam at Beauharnois.

We would also add to our interim report on this subject, the recommendation that three piers and two booms be first placed near the main channel, where the frazil flow is greatest, and their action observed before extending to the shores. This course would be valuable, particularly for the purpose of ascertaining by actual experiment, the class of boom best adapted to the position.

In connection with this question of arresting the descent of ice from points above Montreal, the Commissioners have considered the practicability and propriety of doing so in the Laprairie Basin by means of a line of piers and booms across the channel from the lower end of Nun's Island. If this could be done with safety, the enormous winter flow of ice from the open water between the ice-field in Lake St. Louis and the foot of Lachine Rapids would be intercepted. But as they have reason to believe that frazil flows through the Laprairie Basin under the ice during the whole winter, it is at least very doubtful, in the first place, whether sufficient relief would be afforded by such a line of piers and booms as to warrant the outlay, and, in the second place, it is at least doubtful if it would be safe, even if found practicable, to store a greater quantity of ice in this basin.

The conditions under which the ice takes in Lake St. Louis are very different from those which obtained in the Laprairie Basin. Lake St. Louis closes entirely with severe weather without the aid of drift ice, while the Basin does not close until it is filled up with running ice. The effect of piers and booms in the lower end of Lake St. Louis would be to secure annually and to a fuller extent what nature now gives, when early, and sufficiently long continued cold makes the ice there so strong that there is no danger of it being broken again by a thaw or by winds; and as on these occasions no injurious effects have followed to the localities at the head of the lake, we have not hesitated to recommend piers and booms for that lake. Laprairie Basin, on the other hand, is much shorter, smaller and shallower, and, therefore, has much less storage room for frazil or submerged ice. It is because this basin

remains open until the last, and is only closed by the last of the running ice, and always long after Lake St. Louis has been closed, that dangerous ice dams with the attendant rise of water are not formed at the foot of the Lachine Rapids similar to those that form at Beauharnois, Cornwall and between Montreal and Varennes. If, therefore, piers and booms had the effect of covering this basin with ice at the beginning of winter while Lake St. Louis is still open, and all the ice which now passes Montreal up to the time when the ice bridge from below reaches Victoria Bridge were stopped in this basin, there would be every reason to fear that a pack would be formed there worse than at Beauharnois, because it would catch all the ice from Prescott down until the lakes were closed, and nearly as bad as that at Cornwall, where the water is raised in winter about twenty-five feet above the level of Lake St. Francis, or about the same height as during the highest floods at Montreal.

If piers and booms are first placed in Lake St. Louis then the ice to be stopped in the Laprairie Basin would be reduced to a minimum, so that in any event Lake St. Louis should first be dealt with. There is reason to fear, however, that the fifteen miles of open water between Laprairie Basin and the booms in Lake St. Louis would cause a pack at foot of Lachine Rapids similar to that at Beauharnois and at a point where the rise of water would cause greater injury. Lake St. Francis like Lake St. Louis booms itself by frost without the aid of running ice, but like the latter may be broken up by wind and lose more or less of its border ice throughout the winter. Piers and booms at the lower end of that lake could be adopted without risk and would to some extent diminish the pack at Beauharnois, and this is the only way in which relief can be given in that quarter. But in consequence of the character and extent of the open water between Lake St. Francis and Lake St. Louis there will always be, in severe winters, an ice pack at Beauharnois, and we believe that a similar one would take place in the Laprairie Basin if that were boomed.

VARIOUS SCHEMES PROPOSED.

The Commissioners while conscious that the responsibility of ascertaining the causes of, and suggesting the remedies for ice floods devolved upon them, felt it to be their duty, not only to obtain all the information within their reach, but as a public body, to receive opinions or suggestions from any quarter; and, therefore, in June, 1886, issued an advertisement to this effect (see Appendix). Moreover, the various communications sent to the Government have been referred to them, as also the large amount of evidence taken before the Civic Inundation Committee in 1884 and 1886. That Committee in their final report recommended the consideration of the following remedies:—

1st. The stoppage of the ice at foot of Lakes St. Louis and St. Francis, and other points above Lachine Rapids.

2nd. Removal of St. Lambert wharf, clearing out and deepening the south channel, that is east of St. Helen's Island.

3rd. Straightening, deepening and widening ship channel as far as Longue Pointe.

4th. Removal or shortening of long wharf.

5th. Removal of Isle Ronde and clearing out channels in Boucherville Islands.

6th. Blowing up the ice bridge at different times and places during spring months.

The final recommendations of this Committee were:—

1st. Adoption of higher levels throughout the low-lying districts of the city, at joint expense of the city and locality.

2nd. Reconstruction of revetment wall and levee at Point St. Charles, equitable portion to be borne by the Dominion.

3rd. Application for legislation to enable the Dominion Government and city to initiate and complete the necessary works.

The first two of these final recommendations of this Committee have been fully dealt with, and we have introduced the other six questions which they had previously

recommended for consideration, because they embrace nearly all the classes of remedies proposed, which may be summed up under the two main heads:—

- 1st. Diminution of the quantity of ice descending or packing below the city; and
- 2nd. Removal of "obstructions" supposed to induce floods.

We have dealt fully with the question of diminution of ice, both by arresting it in Lake St. Louis, and keeping it moving out to sea by preventing the formation of an ice bridge below Montreal, until late in the winter.

There remains, therefore, only the important question of obstructions which many believe cause the floods, and the removal of which they believe would prevent them. The first difficulty is to determine what (besides packed ice) is the obstruction. If the flood took place every year and if the ice jam always occurred at the same place, there might be a local cause for it, the removal of which would be a remedy. It is the jam that causes the flood, and, therefore, the obstruction must cause the jam, and the question is whether this obstruction is an island, shoal, wharf or ice; in other words, whether it is the shoving of ice against islands, shoals, wharves or projecting points, or of ice against ice, which causes the flood.

Mr. J. B. De Gros Bois who lives in the lowest of the Boucherville Islands, which has been named after his ancestors who were flooded out there at least seventy years ago, states that Boucherville was flooded in April, 1860, 1862, 1865, 1868, 1870 and 1872. The flood of April 1862 was the highest known. Only one of these, 1865, was a flood year in Montreal, unless he had mistaken 1862 for 1861 which was a high flood at Montreal, while in 1862 the highest water in April was three feet below the revetment wall. He says the Boucherville flood is caused by the ice-piling on the lower portion of the island at Varennes, and the battures (shoals) at Pointe aux Trembles, and that the floods at Montreal are caused by the ice piling on the battures of Longue Pointe and Island of Longueuil.

When the ice shoves against an island, point or wharf, piles to a great height and stops, there is a popular idea that here is the "obstruction" which stopped the ice, and that but for it the ice would have continued to move, and that its stopping is the immediate cause of the flood. This belief no doubt arises from the fact that the departure of the ice is the signal that the flood is over. The force of the shove is really expended against an ice bridge, between these points and islands, or resting on shoals, but these apparent obstructions are the only places where relief is given by the shove. All the ice which is driven by the shove above flood level is disposed of, can be counted out of the race, and the river is by so much relieved. But where the shove is against the ice bridge, backed by an unyielding field of ice extending to Three Rivers, or some seventy miles in extent, the moving ice-field is crumpled on the surface, rides up and piles on this bridge sinking it almost to the bottom, probably quite to the bottom at some places and suddenly forming more or less of a dam, against which the water rises rapidly and floods the region above. This is an obstruction which cannot be removed, but may be diminished by diminishing the quantity of ice as before stated.

The removal of islands and shoals would only have the effect of causing the additional room made in the river to be filled with ice, and of causing more ice to stop near the city, shortening somewhat the length of the ice pack which is now distributed over twelve miles in length of the river down as far as Varennes. Greater space in the water way of the river immediately below Montreal means slower currents and greater deposits of frazil there, as in the case of Beauharnois and Cornwall. If the removal of millions of cubic yards of excavation in order to make more room for the ice, could at all be entertained, the first question which would arise, is, where could the excavation be disposed of. In St. Helen's Island there is an area of one hundred and thirty-two acres, and nearly eleven millions of cubic yards of material above low water mark composed chiefly of volcanic trap rock, nearly half of which is above flood level, and therefore not an obstruction, except to the removal of the greater part of that which is below flood level. This could not be put in the river and would cover nearly two square miles, ten feet deep, and cost about twenty millions of dollars, exclusive of the land for piling ground. We only refer to this preposterous proposi-

tion because the removal of St. Helen's Island was advocated before the Inundation Committee.

Next in order of magnitude is Ile Ronde, the removal of which was thought worthy of consideration by that committee. Here, there is an area of thirty-four and a-half English acres, containing about four hundred and thirty-five thousand cubic yards above low water, chiefly of trap rock. Its removal to that level would be a matter of at least \$1,000,000, and no one can prove that it would not be worse than useless. Moffatt's Island contains over two hundred thousand cubic yards of trap rock the removal of which would cost at least half a million dollars. Its removal was not taken into consideration by the committee (though it has been advocated elsewhere) probably because it is a narrow strip of rock lying parallel with the channel, and not across it like Ile Ronde. The clearing out of the small islets in east channel below Moffatt's Island is a comparatively small affair, involving the removal of about thirty thousand cubic yards of trap rock, which if not deposited in the river might cost \$75,000 to \$100,000, including service ground. These islets are very small and very low, and are covered four to eight feet deep by the winter rise. Their removal could only be advocated for the reason that they may cause ice to ground upon them and form a dam. There was no evidence of this in our observations last winter, and until it can be shown that they have any effect on ice movements we do not think their removal would warrant its cost.

The above are all the visible, natural obstructions mentioned, except the islands below Ile Ronde, points and shoals, but the Inundation Committee referred to the straightening, deepening and widening of the ship channel as far down as Longue Pointe. So far as this is needed to improve the ship channel, as such, there would be value received for the outlay. Widening the deep-water channel would increase the water way at its most effective point, and give more and speedier relief during a "shove," but as we cannot tell where this will take place or how much ice it will force into a particular part of the channel, we cannot count upon a substantial relief from this source.

There remains only to be noticed the artificial obstructions. The St. Lambert wharf on the east side of the main channel, and the long wharf on the opposite or Montreal side. The St. Lambert wharf runs at right angles to the shore across the channel between the later and Moffatt's Island, a distance of seventeen hundred feet, and crossing the island projects eleven hundred feet beyond it to the edge of the main channel in the Sault Normand. Between the island and the shore there are twenty-two piers of cribwork filled with stones, the spaces between the piers being only seventeen feet. The height of the wharf above low water is about six feet.

Outside the island the wharf is solid continuous cribwork, and the whole including the piers measures about sixty-one thousand cubic yards of cribwork. These piers are submerged on the taking of the ice, which, when the water falls, lodges upon them and forms more or less of a wing dam to the river here.

There is a channel between Moffatt's Island wider and deeper than that between Moffatt's Island and the east shore, not affected by the St. Lambert wharf through which the channel east of St. Helen's receives the greater part of its water.

The piling of the ice on the St. Lambert wharf would have little effect, if the channel between it and St. Helen's remains open. If both are closed by a shove, all the water must pass by St. Mary's current, and thus cause higher water in Montreal Harbour.

The bottom of St. Lambert channel is nearly the same level as the summer water in Montreal Harbour. When a flood level is reached, this channel may have more than twenty feet in depth, and is then an important factor of relief, if not barricaded with ice.

If St. Mary's current is blocked by ice, then the closing of the east channel might cause or increase a flood at Montreal. The Royal Commissioners of 1841 say it was generally observed that when the ice passes down the east channel (that is the channel between St. Helen's Island and St. Lambert) without choking or shoving, there is no excessive rise of water in the Harbour. This report was made long before the St.

Lambert wharf or the Victoria Bridge was constructed, and would go to show that when the river was in its natural state, the east channel was exposed to shoves and liable to be "choked." Before the bridge was constructed all parts of the river below it were more exposed to severe "shoves" than they have since been, because the ice-field of the Laprairie Basin was then set in motion. This movement is now arrested by the bridge piers, and only floes limited by the openings can be driven below. Although St. Mary's current is generally free from packed ice, yet during a shove which is arrested above Longue Pointe, it becomes gorged with ice to such an extent that a free water way in the east or St. Lambert's Channel would then be most important. We are therefore of opinion that the remains of St. Lambert wharf should be removed. We think the loose stones could be boated away at the proper pitch of water, and could be utilized so as to defray a large portion of the cost. Until the disposition to be made of them is determined, it would be useless to make any estimate of the probable cost of the work.

For similar reasons we recommend the removal of the old contractors wharf jutting out into the channel from the west abutment of the Victoria Bridge.

As to the long wharf or the Victoria Pier, its effect on the floods must be insignificant, the fact that the ice piles on it during a shove has given it importance, but had it not piled there it would have done so on the shore a little further on. It is because there was no sufficient body of ice in St. Mary's current below this wharf to stop the shove that the latter moved on, its wings clipped by the wharf just as they are by the shores in the narrower portion of St. Mary's current which is below the wharf.

In the ten years from 1876 to 1886, about eight hundred thousand cubic yards (scow measurement) of dredged material was deposited in the five miles of river between Ile Ronde and the Boucherville Islands, chiefly immediately below the former, and immediately above the latter, or at the tail of one bank and at the head of another. In these positions it would offer the minimum of obstruction to the flow of the river.

There was no means at this time of ascertaining the extent of this deposit, at any one point. Compared with the amount of ice found in this section of the river in March, 1887 (which was sixty two millions cubic yards) the dredgings if all remained during the ten years would be about one and a-quarter per cent., and compared with the total water under the ice in the same section of the river, (which was ninety-onemillions five hundred thousand cubic yards) the dredgings would occupy less than one per cent. of that water section.

This deposit of dredgings was discontinued early in 1886, and has not since been resumed.

Compared with the volume of the river at the breaking up in April, this deposit is so small that we do not think it has had any sensible effect in increasing the floods at Montreal.

CONCLUSION.

The unprecedented flood of April, 1886, was undoubtedly the greatest by several years; of any recorded. This excessive rise was no doubt due to the combination of several causes: the worst conditions of ice and the highest known level of water at this early period of the year, in both the Ottawa and the St. Lawrence. Although our northern rivers do not attain their flood level until nearly a month after the breaking up of the ice at Montreal, there is no doubt that higher floods than those obtained in the early history of the country, will in future be the rule, owing to the increased frequency of the changes produced by settlements and the clearing of vast areas formerly covered by forest. If a large body of snow remains until the middle of April and then suddenly converted into water by a high temperature and a powerful sun, acting upon a surface unprotected by forests, an unusual amount of water for the season of the year may be suddenly thrown into the streams while they are blocked with ice, and by increasing the intensity of the shoves carry the flood to a higher level than before. No amount of water alone would at this time cause a flood, which we know has occurred

from ice alone in January when the water conditions are reversed; but the April ice floods will always be aggravated by an increased quantity of water forcing its way through these excessive accumulations of ice.

The physical features of the St. Lawrence, at and below Montreal, fully account for the greater intensity of the ice floods here, and they are upon such a scale that it is not commercially practicable to change them so as to produce any appreciable effect upon the river, and could they be changed it is at least doubtful whether any benefits would be derived from such alterations.

The physical features which contribute to the floods here are both opposite to and far below the city.

The summer difference in level between the water in the Harbour of Montreal, and that in river below Ile Ronde, ranges between two feet and two feet three inches. In winter the difference of level varies much more, sometimes being more, sometimes less than the summer difference. The variation here is greatest during shoves; thus, during the flood which commenced on the 22nd April, 1887, while the water rose from three and a half feet to over four and a half feet above the revetment wall on that day, it was about six feet lower at Ruisseau Migeon (Hochelaga) or about two feet below the revetment wall. On the following day the difference of level was reduced to five and a quarter feet the level at Hochelaga then being about eighteen inches below the revetment wall. After allowing the two feet summer difference of level between these points, there remained from three to five feet difference, caused by an ice gorge somewhere between these points during these five first days of the flood. It might be assumed from this, that if Ile Ronde, St. Helens and Moffatt's Island were removed, and the St. Lambert Channel deepened, this difference of level might have been reduced. But on the following day, 24th April, when the water in Montreal had fallen six inches, and stood three and a-half feet above the revetment wall. At Hochelaga it had risen nearly four feet higher than on the previous day, and stood then at a level two feet three inches higher than the top of the revetment wall. The difference of level between the harbour above Victoria Pier and Hochelaga was reduced to one foot three inches, that is considerably less than the summer difference. On the 25th the water fell nearly equally at both points, but rather more at Hochelaga, and the difference of level was increased from fifteen inches to two feet, the level at Hochelaga being still higher than the revetment wall. On the 26th the water fell almost equally at Hochelaga and Montreal, the difference of level being then two feet one inch. The water in Montreal was then one foot one inch over the revetment wall, and at Hochelaga one foot below it. There was therefore during three days of this flood, between the 23rd and 27th of April, an ice block below Hochelaga, which, without reference to any obstructions above that point, would have flooded Montreal. A similar condition of things existed during the flood of April, 1886, the level at Hochelaga for the four days between the 16th and 21st April, being less than two feet below the revetment wall, and on one day within one inch of its level. On the 27th April, 1885, the Hochelaga level of the river was only ten inches below the revetment wall, and from levels taken at Hochelaga during the flood of April, 1861, the water then stood within four inches and a

The top of the revetment wall.

channel be four flood years therefore which are the only ones in which levels have the water at both these points, there was an ice dam below Hochelaga which would Harbour, a flood in Montreal without reference to any river obstructions between

The both If anything is to be effected by removing obstructions, therefore, we in Montreal below Hochelaga. These would include Longue Pointe, Pointe aux more than two islands and most of the islands down to Varennes, as well as barricaded with them. If it were possible to remove all these obstructions

If St. Mary's river below St. Helen's into a lake, the Commissioners believe cause or increase Beauharnois would be repeated with worse than Beauharnois conditionally observed, conditions more similar to Cornwall. Ice which is now carried between St. Helen's and below Varennes, would be arrested by an earlier former excessive rise of a bridge over this slackened water, and be stored above Longue

Between Longue Pointe and Hochelaga, a distance of two and two-thirds miles, the difference of level in September, 1886, was only about six inches, but in December, when the river closed, it had increased to four feet, the fall between Hochelaga and the harbour (at lock) being at the same time only one foot two inches, or less than in September, when it was two feet.

At the taking of the ice in December, 1886, the river was eleven feet five inches higher at Longue Pointe, and fifteen feet nine inches higher at Hochelaga than in the previous September. The greater part of this section of the river is free from islands; its average width is one and one-fifth miles, and its average depth sixteen feet. This average depth was increased thirteen feet two inches at the closing of the river in December, giving an increase to its waterway of eighty-two per cent., and the fall per mile was increased eight times, or from one and a-half inches to one foot per mile. The velocity due to a head of twelve inches per mile, in this case, with the river free from ice, would be five and two-fifths miles per hour, and the discharge would be about one million two hundred and fifty thousand cubic feet per second. The summer velocity between these points is about two and three-quarter miles per hour, and the discharge (as measured at Lanoraie) was three hundred and fifteen thousand cubic feet per second. Assuming the quantity of water to be passed to be the same as that measured at Lanoraie in November, the required sectional area under a fall of twelve inches per mile would be about forty-five thousand six hundred square feet, or only twenty-five per cent. of the actual area of water way when the river closed.

These figures are given for the purpose of showing how great a mass of ice there must have been in this section at that time, and to explain the conclusion to which they lead that there must have been, under or between these ice packs, a velocity capable of transporting submerged ice, because, on the 27th March, 1887, the water had fallen below the level of December about five feet at the lock, three feet seven inches at Hochelaga, and two feet at Longue Pointe. If the frazil which was observed passing down through the winter had not thus been disposed of, the water should have risen instead of having fallen at Montreal.

This distributing action of the river while disposing of its ice took place without a flood in December, 1886, and this has been the result of the winter rise, with only one exception, during the last forty years. This power of distribution is due to those features in the river, some of which have been referred to as obstructions. They cannot be removed without weakening the current which now carries so much of the ice to sections of the river below Longue Pointe, and where it no longer threatens Montreal.

A wide, hard trap floor rising to low water mark on the St. Lambert shore, occupies the greater part of the breadth of the river opposite the city (the St. Lambert pier being three thousand feet in length to reach six feet of water), and St. Helen's and Ile Ronde are outlying and elevated flanks of the rock formation which protrudes through the soft black shales as dykes from Lachine to Longueuil. Both are seen in the excavation of the aqueduct of the Montreal waterworks. The volume of the river is diverted by these trap dykes toward the Montreal side, turning then at St. Helen's and Ile Ronde, and excavating its low water channel in the shale to the west of them. The river here is forced through a narrow though deep channel, having an average fall of three feet per mile for the first three miles below Victoria Bridge. These conditions are undoubtedly obstructions while the ice is in motion. Enormous masses of ice are suddenly forced through this narrow passage, sending the water surface opposite St. Helen's up to a height much in excess of that in the wider parts of the river above or below. Thus, when after the flood of April, 1886, the dam burst below Hochelaga, the ice-laden flood wave which swept through this channel attained the height of twenty-seven feet above the summer level, then fell immediately to twenty-four feet below Ile Ronde, to twenty-one and a-half at lower Longueuil, settling down to twenty feet at Longue Pointe and maintaining that elevation thence to Lanoraie, a distance of thirty miles; then falling as it approached Lake St. Peter, it was reduced to sixteen feet above low water at Sorel. This wave started from Montreal

at 11.45 a.m. on 20th April, 1886, reaching Sorel (forty-five miles distant) at 10 p.m. the same day.

The St. Lambert Channel, between Moffatt's Island and the eastern shore, is about one thousand six hundred feet wide, but very shallow, being nearly dry at lowest water. It may be called a natural waste weir to the submerged dam which connects the Point St. Charles shoal with those at St. Lambert, and which is cut through by a narrow channel having less than ten feet depth at low water, through which passes the Sault Normand. The average level of the rock bottom, three hundred feet below the shore end of the St. Lambert wharf, is upon the same level as the surface of water in the main channel above the outer end of that wharf. Opposite the foot of this island it is three feet higher, and opposite head of St. Helen's six feet higher than water surface in main channel. The rock bottom of this channel runs approximately level for a distance of five thousand feet, while the surface in main channel is falling rapidly in the Sault Normand and Current St. Mary. In consequence of this shallowness and its being obstructed by the wharf piers, it is frequently closed by the first shove. There is a deeper channel between Moffatt's and St. Helen's Island by which (when not itself gorged by a shove) relief is given when St. Mary's current is gorged, which only occurs during a shove. The deepening of these channels on the east shore has been advocated as one of the measures of relief, but so long as the ice packs (as shown above) between Hochelaga and Longue Pointe, there would be no benefit derived from such deepening, commensurate with its cost. When it is considered that to make additional room for ice and water, an equivalent space must be excavated below water in the hardest description of rock, it will be seen how hopeless this contest with nature would be. If there were no question of ice, the full water space excavated in it would be gained, though at a cost which, if proposed upon any useful scale, would be prohibitory; but when there is the probability that any excavated channel could be filled at a single shove, in a few minutes, by ice supplied without stint and without cost by the river, the Commissioners (even without the consideration of its uselessness, whenever there was an ice dam below St. Helen's) would not feel warranted in advising such an expenditure.

The Commissioners have, therefore, come to the conclusion that there is no practicable remedy for mitigating the effects of ice floods in this portion of the St. Lawrence, but in the direction of efforts to reduce the local accumulation of ice by diminishing the amount of descending ice as far as practicable or by retarding the formation of the ice bridge as long as possible. Such means, however, though promising largely to reduce the rise of the river, would be to some extent experimental, and could not under all conditions be relied upon for the protection of the city.

The Commissioners therefore recommend that the temporary dyke, which has since been constructed, be made permanent, as soon as a site for the same has been prepared in connection with the projected improvements in Montreal Harbour, as described in our report of 5th May, 1887.

In that report the Commissioners say: "The Commissioners refer to this question of wharfage height in consequence of its connection with that of a permanent dyke. The thickness and cost of a revetment wall depend upon its height, and as the permanent dyke must be either in connection with a new revetment wall or (in the absence of one) upon a foundation for the level of Commissioners' street; the condition precedent to its location and mode of construction is the settlement of these questions of the new line for the wharves and the height of the same.

"Should it be found advisable to raise the wharf level with its railway tracks and sheds above the winter level of the river abolishing thereby the Revetment wall and its ramps, all that will then be necessary for protection from floods attaining a higher level will be a permanent dyke or rampart of substantial masonry, placed at a safe distance from the wharf front. This safe distance has been established by more than forty years' experience as that between the revetment wall and the buildings fronting upon it. Openings through this parapet for cartage purposes would be closed by stop gates during the flood period.

"If the high or Commissioners street level be adopted for the wharves along this portion of the city front, permanent sheds, bearing the same distance relatively to the wharfage front as the buildings on Commissioners street now do to the Revetment wall, would be resorted to and the Commissioners think that the parapet wall could be utilized in the construction of such sheds.

"It could also make possible an elevated railway, reaching to the manufacturing districts at either end of the city without interrupting the traffic of the Port."

THOS. C. KEEFER,
HENRY F. PERLEY,
JOHN KENNEDY,
PERCIVAL W. ST. GEORGE.

MONTREAL, 15th April, 1888.

APPENDICES.

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1. On the Pointe St. Charles Levee, dated 31st July, 1886.
2. On ice breaking by means of tugs, dated 28th October, 1886.
3. On blasting of the ice at Longue Pointe, dated 10th March, 1887.
4. On dyke north of Lachine Canal, dated 5th May, 1887.
5. On piers and booms in Lake St. Louis, dated 12th August, 1887.

NOTES, TABLES, &C.

6. The "taking of the ice" in the River St. Lawrence in the winter 1886-1887.
7. Memo. temperature of the air, water, and frazil in Lake St. Louis, February and March, 1887.
8. Table giving duration and mean degree of winter frost for 47 winters, also winter and spring high water and flood years for 37 years.
9. Table giving date and height of the highest water at Montreal for 36 years, spring and winter, i.e., at "Breaking up" and "Taking of the ice;" also, the height of water at Ottawa and Toronto on the same dates, with averages for flood years and non-flood years.
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29. Extract.—Relation de ce qui s'est passé en la Nouvelle-France en l'année 1643 —Chapitre XI. De ce qui s'est passé à Montreal, par le P. Barthélémy, Vimont, S. J.
30. Notice asking for information.

MONTREAL FLOOD COMMISSION,
MONTREAL, 31st July, 1886.

SIR,—The Commissioners appointed to “enquire into the causes and suggest remedies” for the ice floods in Montreal, immediately upon their organization last month, made arrangements for the land and river surveys, and the investigations necessary in dealing with so great a question, and these are now being actively prosecuted.

The Commissioners conscious of the great desire on the part of the citizens of Montreal that every possible effort should be made to prevent the recurrence of the disastrous floods of April last, took immediate steps to deal with the protection of the district south of the Lachine Canal, relative to which a charter was obtained at the last session of Parliament for the construction of a dyke or levee. They have prepared and herewith submit a plan showing the position of the site proposed for this dyke, together with the estimate of the probable cost.

The area which would be protected by this dyke is bounded by the Lachine Canal, the river St. Pierre, the tail-race of the Montreal Waterworks, and the River St. Lawrence, from the city limits as far down as the waste weir at Tate's dry dock, and includes nearly the whole of the municipality of St. Gabriel, excepting the Islands of the St. Lawrence. The area protected within the limits of the city of Montreal is about 360 acres and in St. Gabriel about 300 acres. The assessed value of this area is nearly five millions of dollars, of which about one million eight hundred thousand dollars is in St. Gabriel.

The route of the dyke is along the present road and top of river bank, from Tate's dry-dock to a point about 3,000 feet above the Victoria Bridge. Here it turns inland, crossing the city limits at the rear of the property belonging to the estate Knox and strikes the tail-race embankment near Wellington street, otherwise known as the lower Lachine Road, passing in rear of the farm house on the property of the Congregational Nuns.

The tail-race bank is now being raised by the city to the level proposed for the top of this dyke, which is twenty-nine feet above the city datum or summer level of Montreal Harbour. The level of the top of the dyke would be one foot six inches above the highest level of the floods of April last, and is nearly the same as the coping of Tate's dry dock, as also of the rails of the Grand Trunk Railway where crossed by the dyke. The connection of the head of the tail-race with the Lachine Canal bank completes the route of the dyke.

The estimated cost of the dyke and the necessary pumping plant and drainage works required in connection with it will be about \$85,000. The land is valued at about \$35,000, making a total of about \$120,000. The land valued is much more than will be required for the site of the dyke, as it includes the whole of such building lots as are affected by the close proximity of the embankment; also a considerable acreage of low ground, which is not suitable for building purposes, from which it is proposed to take the material required for the embankment.

The estimate for the drainage and pumping works also includes sewers, which though now only wanted in connection with a dyke, will ultimately be of value to the city as sewers.

The estimate and the right of way provided for are for a dyke alone, but the culverts are lengthened to admit of widening the dyke for a future road way.

The final location, breadth, &c., may be modified by arrangements with the proprietors. These are few in number, and the most important of them are quasi-public bodies.

The Commissioners think it probable that it may be decided to construct at once the levee, on account of its simplicity, certainty of effect, the small amount of dam-

age or inconvenience to be caused by it, and its moderate cost in proportion to the large amount of property it would benefit, as well as because any alternative scheme involves delay and the risk of further possible damage. The protection of the remainder of the exposed district of the city, north of the Lachine Canal, by raising the river front, is a work of much greater magnitude, involving, as it does, the almost entire reconstruction of the revetment wall. In connection with the plans and estimates required to show the cost of this work, the Commissioners are now conducting surveys and investigations for the purpose of ascertaining the practicability and probable cost of diminishing the floods, and reducing them within harmless limits by means of river works.

We have the honour to be, Sir,

Your obedient servants,

THOS. C. KEEFER,
HENRY F. PERLEY,
JOHN KENNEDY,
PERCIVAL W. ST. GEORGE,
Commissioners.

A. GOBEL, Esq.,

Secretary Department Public Works, Ottawa.

ESTIMATED cost of proposed Point St. Charles and St. Gabriel Dyke.

Embankments, culverts, fencing, &c.....	\$ 37,400
Pumping and drainage works.....	41,600
	<hr/>
	\$79,000
Engineering and contingencies.....	6,000
	<hr/>
	\$85,000
Land valuation.....	35,000
	<hr/>
Total.....	\$120,000
	<hr/>

MONTREAL FLOOD COMMISSION,

MONTREAL, 28th October, 1886.

SIR,—The Commissioners have had under consideration one of the proposed methods of dealing with floods at Montreal, which has the advantage of being applicable to other points on the river, between Lachine Rapids and Lake St. Peter, namely, to keep open the channel between Sorel and Three Rivers, for a period of time long enough to remove a great portion of the floating ice, which is now arrested between Montreal and Sorel. If this can be done, the river, with its dangerous burden of ice, will be kept within its banks, and both shores of the St. Lawrence, between Three Rivers and the Lachine Rapids, relieved of the risk due to inundations caused by ice.

Last winter the ice did not stop in the channel at any point below Three Rivers, and the presumption is that had the ship channel through Lake St. Peter and the Sorel Islands been open, the ice from above would have continued to pass down and out to sea, because the channel of the River St. Lawrence, between Montreal and Sorel, is not closed in the natural way by ice of first intent, but this channel remains open between its bondage ice until after Lake St. Peter and its island channels have been frozen over in the natural way, and is only closed as it is filled up with floating ice from above.

It is asserted that the open channel below Three Rivers last winter, which was a severe one, was due to the continuous running of the ferry boats at Quebec, and to the efforts made by them to prevent the formation of an ice bridge. It is impossible to say what may take place another winter, but the chances are in favour of an open channel for the future if the same exertions are made at Quebec. Portions of this reach between Three Rivers and Quebec, as at Cap à la Roche are generally open, and if the channel below Three Rivers can be kept open during a portion only of the winter, it would effect the object in view—that is, get rid of enough of the arrested ice above Lake St. Peter to prevent the ice-floods at Montreal and elsewhere below Lachine.

Ice-breaking boats are used in the Delaware and Chesapeake Bays to maintain an open channel for navigation to Philadelphia and Baltimore. At the latter place ice-ploughs are applied to ordinary tugs at an expense of about \$250 each. For the purpose of an experiment, four of the tugs of the Montreal Harbour Commission could be fitted up as ice-breakers for the sum of \$1,000. The daily cost of running would be about \$30 each, or a total of \$120 a day. The duration of the service would depend on the result. They would be kept in commission as long only as they were effective. If they only succeed in keeping an open channel until the descent of the ice from Lake St. Louis is arrested by advancing winter, we believe this alone would prevent a dangerous ice-flood.

The Commissioners are fully impressed with the uncertainty which is inseparable from such an experiment, and it is in the light of an experiment only in which they wish it to be regarded. They have considered the difference in climate between the Chesapeake and the St. Lawrence. They are aware that conditions of weather may occur which (with the appliances available) may render the attempt abortive, but they believe that every day in which the ice from above Sorel can be kept running past Three Rivers will tend to alleviate the risk of ice-floods, and if unsuccessful, they have the satisfaction of remembering that the stoppage of the ice carries with it a stoppage of the expenditure also. They are, therefore, of opinion that the experiment is well worth the cost involved, and they are aware that much larger sums have been expended in experiments when the interests at stake were small in comparison with this.

The Commissioners recommend that the Government authorize the expenditure of \$5,000 as a special appropriation for this service, and that the Harbour Commissioners of Montreal be requested to grant the use of four of their tugs for the same.

We have the honour to be, Sir,

Your obedient servants,

THOMAS C. KEEFER,
JOHN KENNEDY,
PERCIVAL W. ST. GEORGE.

I have to dissent from the recommendation contained in the last paragraph, as I hold the opinion that the prevention of floods, or bearing the cost of the means to prevent their occurrence or to lessen their severity, does not lie with the Government. The remainder of this letter has my approval.

HENRY F. PERLEY.

A. GOBEL, Esq.,
Secretary, Department Public Works,
Ottawa.

MONTREAL FLOOD COMMISSION,
MONTREAL, 10th March, 1887.

SIR,—The Commissioners, on account of the severity of the past winter, the strength of the ice covering below this city, the large amount of snow remaining at this date, and the possibility of a rapid thaw accompanied by heavy rains producing

a break-up while the ice is yet very strong, have had under consideration the propriety of an experiment with explosives, for the purpose of weakening the ice about and below Longue Pointe, where they believe its long continued firmness last April was the chief cause of the excessive flood in that month. As this is the only means of amelioration that is now available, against the possible effects of the approaching break-up, they have come to the conclusion that, however uncertain may be the result, the experiment ought to be made, especially as it will not be attended with very great expense.

It is possible the river may break up and the ice depart without producing a flood, as is the case in the majority of years. The spring floods in the last quarter of a century have occurred always in the month of April, and only in the years 1861, 1865, 1869, 1885 and 1886, the last reaching two feet nine inches higher than any of the preceding ones. This gives five spring floods in twenty-five years, an average of one in five years, but since they occurred in both 1885 and 1886, another is possible this year. It is impossible to resort to explosives with any hope of success after the movements of the ice has developed the probability of a flood.

They propose, therefore, to break up with explosives the field-ice in the main channel extending from above Longue Pointe towards Ile Ste. Thérèse, upon which they ask authority to expend a sum not exceeding \$3,000. The ice, of course, cannot be removed from the channel, but, if so broken up, the better exposure to the influences of advancing spring, and wear of current would, they believe, so weaken it that it would give way before the down coming ice, and allow the latter to be distributed over a greater length of river, thus forming a longer and lower temporary dam.

As the authority of the Dominion Government will be required for any such experiments in the main channel of the River St. Lawrence, the Commissioners request the same to be given them for this purpose at as early a date as possible.

We have the honour to be, Sir,

Your obedient servants,

THOS. C. KEEFER,
JOHN KENNEDY,
HENRY F. PERLEY,
PERCIVAL W. ST. GEORGE.

A. GOBEL, Esq.,

Secretary Department Public Works, Ottawa.

MONTREAL FLOOD COMMISSION,

MONTREAL, 5th May, 1887.

SIR,—The Commissioners have the honour to report that they have completed the surveys and observations of the River St. Lawrence in connection with their investigation into the causes and suggestions of remedies for the floods at Montreal. These observations have extended from the ice packs below Morrisburg to Quebec, a distance of 250 miles; but the ice surveys have been confined to the portion of the river between the head of Lake St. Louis and the Platon, about thirty-six miles above Quebec—the lowest point an ice bridge was formed during the past winter.

The object of these surveys—the first of their kind which have been taken in connection with the ice question—was to ascertain the practicability of holding back above Montreal, as well as of passing out to sea below Three Rivers, a sufficient quantity of that ice, which, by its packing immediately below Montreal, is the sole cause of the floods.

The field-work in connection with these surveys, observations and ice-charts was only completed last week, and on account of the many questions involved and the various projects supported by worthy persons, some time will be required to prepare our final report, and to put on record the large amount of new and valuable information which has been obtained.

In view of the urgency of the question the Commissioners now beg leave to report the result of their investigations, and the conclusions at which they have arrived, in order that prompt action may be taken to protect the city of Montreal before another winter.

In the first report, dated 31st July, 1886, the Commissioners presented plans and estimates for a dyke, or embankment, extending from Tates' dry dock at the head of Mill street along the river front to the St. Pierre River at the Lower Lachine Road, there to connect with the embankment of the waterworks tail-race, and stated that they thought it probable "that it may be decided to construct at once this levee, on account of its simplicity, certainty of effect, the small amount of damage or inconvenience to be caused by it, and its moderate cost in proportion to the large amount of property to be benefited by it, as well as because any alternative scheme involves delay and the risk of further possible damage."

With respect to the exposed district north of the Lachine Canal by raising the river front, the commissioners stated in that report that it was "a work of much greater magnitude, involving as it does almost the entire reconstruction of the revetment wall," and that in connection with this work they proposed to ascertain "the practicability and probable cost of diminishing the floods, and of reducing them within harmless limits by means of river works."

The Commissioners have now to report as the result of these investigations, their opinion that, while an important diminution of a quantity of ice which is now arrested below Montreal may be effected by river works, or by annual work in the river, which may be the means of averting a flood in certain years, and more especially a winter flood, in other years they might prove ineffectual for the protection of Montreal, especially against spring floods, and they are forced to the conclusion that there is no absolute certainty of protection for Montreal but in excluding the river by a dyke, or in raising the low districts above flood level.

EXCLUSION OF THE RIVER.

The questions connected with a dyke upon a permanent plan along the front between the canal and the Canadian Pacific revetment wall, are of such magnitude that so long as there was hope of protection in any other direction, the permanent dyking of a portion of the city front must be regarded as a work of last resort.

The raising of Commissioners street above flood level would be the most simple, permanent and effectual manner of dealing with the question, regardless of all other considerations. But this work calls for the simultaneous reconstruction of the revetment wall of a greater thickness and to a greater height, and upon its present site. Commissioners street is too narrow for the present, and still more so for the early future requirements of the commerce of Montreal; nor can it at present be widened, because the wharfage width between it and the ships is equally insufficient, and the commerce of the port is of more importance to the city and the Dominion than the width of the street. Commissioners street, therefore, cannot be widened, nor can its revetment wall be reconstructed where it ought to be for the purpose of a dyke, until there is an advance of the whole wharfage front, which carries with it an advance of the outer or eastern line of the dredged channel for its entire length; again the raising of Commissioners street to the height of at least six feet, means an unknown amount for property damages along the whole route, and extending inwards towards the city at every connecting street—so far as property would be affected by the re-arrangement of street grades. But, probably, the most serious matter would be the interposition of a rampart six feet in height between the city and the port, over which all the tonnage must be carted. About ten years ago a commission of engineers recommended the widening of the wharves and of this street, and we understand that financial reasons alone have hitherto prevented any work being done in this direction, but as Montreal will soon require all the harbour facilities which her position is capable of, there is very little doubt that this enlargement of the harbour front and of Commissioners street will soon be undertaken, and until this is done it will be necessary to postpone the permanent dyke required as protection from floods.

Since the report of the engineers above referred to, the question of the proper height of wharves for the accommodation of the larger class of steamers, which the deepening of the river has brought to the port, has been raised. The present level of wharves was adopted when the shipping of the port was confined to vessels of a few hundred tons. Ocean steamers of many thousand tons now frequent the port in such numbers as to need all the central portion of the harbour, and for these steamers the Commissioners understand a higher level of wharf would be more convenient. The higher the wharf level the easier the cartage, and the less the space occupied by ramps.

Montreal is the only city whose wharves are submerged continuously for five months in the year, and Captain Barclay, for many years in control of the loading and discharging of the Allan steamers, is of opinion that the level of Commissioners street, itself, would be the most convenient one for ships of that line. This, if applied throughout, would practically abolish the revetment wall, substituting the wharf front in its place.

The Commissioners refer to this question of wharfage height in consequence of its connection with that of a permanent dyke. The thickness and cost of a revetment wall depend upon its height, and as the permanent dyke must be either in connection with a new revetment wall or (in the absence of one) upon a foundation for the level of Commissioners street—the condition precedent to its location and mode of construction is the settlement of these questions of the new line for the wharves and the height of the same.

The retention of the present level of the wharves with a new revetment wall so placed as to give a hundred feet width to Commissioners street, would, with the present system of wood construction, give the least amount of perishable work and would cost about \$1,200,000.

To raise them to the level of Commissioners street and provide a dyke against floods above that level would cost about \$1,700,000.

Should it be found advisable to raise the wharf level with its railway tracks and sheds above the winter level of the river, abolishing thereby the revetment wall and its ramps, all that will then be necessary for protection from floods attaining a higher level, will be a permanent dyke or rampart of substantial masonry placed at a safe distance from the wharf front. This safe distance has been established by more than forty years' experience, as that between the revetment wall and the buildings fronting upon it. Openings through this parapet wall for cartage purposes would be closed by stop-gates during the flood periods.

If the high or Commissioners street level be adopted for wharves along this portion of the city front, permanent sheds bearing the same distance relatively to the wharfage front as the buildings on Commissioner street now do to the revetment wall, would be resorted to, and the Commissioners think that the parapet wall could be utilized in the construction of such sheds.

It would also make possible an elevated railway reaching the manufacturing districts at either end of the city, without interrupting the traffic of the port.

The annual cost connected with the temporary sheds has been estimated as high as \$10,000. There is a further charge for removal of ice as well as the additional time and cost of cartage in favour of the high level wharf.

Whether these advantages will be considered sufficient to compensate for the half million dollars greater cost of the high level, is in the future.

ELEVATION OF FLOODED DISTRICT.

The raising of the low districts above flood level involves an outlay upon twenty-six miles of streets in this district of upwards of one million of dollars, exclusive of the cost of raising the buildings and lots, and is, in any case, the work of years. For the purposes of flood prevention the raising of Commissioners street alone would be sufficient, and nothing would be gained except in a sanitary point of view by raising any other streets or buildings, because pumping must still be resorted to during floods, after the streets, lots and buildings have been raised, if the cellars are

to be kept dry. It cannot be supposed that this whole district would be raised another six feet for the benefit of the cellars.

We have already referred to the questions of the raising of Commissioners street, and would only add, upon the question of cost, that nothing is to be gained in that respect by the raising of the street itself. The necessary revetment wall would afford the required protection from floods, whether the street were raised or not, and this revetment wall is a necessary adjunct to the raising or maintenance of the street.

As there is, therefore, no means of protecting the river front north of the Lachine Canal upon any permanent plan in time to provide against the contingency of another flood, the Commissioners have decided to advise the erection of a temporary dyke upon the top of the revetment wall, to be constructed of timber and earthwork, with openings through the same for access to the wharves, which are to be closed when navigation ceases. This can be effected in a short time and at a cost under \$50,000, which includes supporting the revetment wall where required, seeking for and cutting off old drains or leaks connecting with the river so that the minimum of pumping would be secured.

ESTIMATES.

The present pumping plant was hastily improvised and cannot be relied upon; it is, moreover, insufficient in capacity for the work it may be called upon to do during a flood, as there has as yet been no experience in pumping with the river at a higher level than the revetment wall.

For permanent plant about \$46,000 will be required and this estimate is based upon the carrying out of the intercepting sewer, which we understand has already been determined upon by the city.

Since our estimate of July, 1886, for the Point St. Charles dyke, some expenditure of a permanent character has been made there for the drainage works, reducing by so much our provision under that head.

The cost of the protection works will now be as under:—

Embankments, culverts, fencing, &c., Point St. Charles....	\$37,400
Drainage works.....	14,000
Land valuation	35,000
Temporary dyke revetment wall (say).....	40,000
Superintendence, contingencies, &c.....	6,000
	<u>\$132,400</u>
To which should be added for permanent pumping plant.	46,000
	<u><u>\$178,400</u></u>

We have the honour to be, Sir,

Your obedient servants,

THOS. C. KEEFER,
HENRY F. PERLEY,
JOHN KENNEDY,
PERCIVAL W. ST. GEORGE.

A. GOREIL, Esq.,

Secretary Department of Public Works, Ottawa.

MONTREAL FLOOD COMMISSION,

MONTREAL, 12th August, 1887.

SIR,—In obedience to your verbal request, made to one of their members, the Chief Engineer of Public Works, the Commissioners have the honour to report that they have prepared plans and estimates for a line of piers and booms at the lower end of Lake St. Louis.

In their report of 5th May last, the Commissioners stated their belief that an important diminution of the quantity of ice which is now arrested below Montreal may be effected by river works or by annual work in the river—that is, by holding back the ice above Lachine, or by passing it out to sea below Three Rivers. Of these two methods one would be represented by works of construction in the river, requiring only the annual labour of opening and closing the booms; while the other to be effective, would require a capital outlay for properly constructed ice-breaking steamers, and considerable annual expenditure in fuel, wages and repairs. The action of the piers and booms would be independent of the character of the winters, while the cost and even practicability of the alternate method would materially depend upon the weather; and it was in view of this that the Commissioners recommended an experiment to be made last autumn, with the tug boats of the Montreal Harbour Commission.

The practicability of arresting floating ice when young, and of causing ice to form at points where the current is sufficient to prevent freezing, by means of booms, has been established upon the Ottawa River and its tributaries, notably at Deux Rivières, which point we have surveyed in order to compare the currents and conditions there with those in Lake St. Louis below Ile Dorval; and we have come to the conclusion that the ice can be arrested at the points proposed by means of piers and booms, without the risk of any alteration in the winter levels of Lake St. Louis.

In the case of Montreal the Commissioners while holding the opinion that the stoppage of the ice in early winter below Dorval would reduce the floods—and even render them harmless in certain winters—felt that when the interests at stake were so great—and a certain remedy was within the reach of those interested—it would have been unwise to assume any risks; but as regards the south shore of the St. Lawrence below the Lachine Rapids the conditions are reversed, and the only relief which can be expected for that quarter is the holding back of the ice above Lachine.

The plan of holding back the ice has been publicly advocated from an early date. By whom it was first suggested is unknown to us, but we find it urged in the columns of the Montreal *Herald* in 1841; and in the report upon the Victoria bridge by the chairman of this commission, in 1853, the opinion was expressed that “a line of piers across this lake, near Ile Dorval, would very much diminish the annual inundations at Montreal.”

Since 1852, the year when the record of winter gangings at Montreal commenced, the river has closed ten times in the month of December, and always without a winter flood. In the other 26 years it has closed in January. The effect of severe continued frost at the beginning of winter is to close Lake St. Louis, and cut off further supply of ice from above the points where it freezes over, and thus prevent a winter flood, which is the most distressing one.

Again, if the ice were held in Lake St. Louis until the river is open below Montreal, the severity of the spring floods should be diminished. Until last April it was generally believed that it was the descent of the lake ice before the river was open below Montreal that caused the spring floods; but the shove and flood took place last spring before the lake ice passed below the Victoria bridge. The river below Montreal was so filled with ice which came down from above the city, before the Laprairie Basin and Lake St. Louis were closed for the winter, as well as by the ice formed in the open water below this lake throughout an exceedingly severe winter, that it did not need the addition of the lake ice in the spring to cause a flood.

The effect of a line of piers and booms below Ile Dorval will be to prevent the descent of any ice from above them until the booms are opened in the spring, also to a large portion of Lake St. Louis, extending to a considerable distance above Dorval, which is now an open factory of frazil and borage ice, which by the action of frost and wind is sent over the Lachine Rapids throughout the winter. The greater part of this ice is carried under the surface through the Laprairie Basin and is packed somewhere between Montreal and Varennes.

The number of piers, each of which will be thirty feet square on foundation, will be nineteen, and the length of two-ply boom will be about fifteen thousand feet, or nearly three miles. The cost of the whole we estimate at \$70,000.

The Commissioners recommend the carrying out of this work as one which, in proportion to the cost, will in their judgment produce greater beneficial results to the exposed districts outside of Montreal than any other river work they are able to suggest.

We have the honour to be, Sir,

Your obedient servants,

THOS. C. KEEFER,
JOHN KENNEDY,
PERCIVAL W. ST. GEORGE.

The Hon. Sir HECTOR LANGEVIN, K.C.M.G.,
Minister of Public Works,
Ottawa.

MONTREAL FLOOD COMMISSION,
MONTREAL, 11th May, 1888.

DEAR SIR,—We beg to acknowledge the receipt of your letter of 20th ultimo, asking the opinion of the Montreal Flood Commission as to whether the proposed enlargement of the Montreal harbour, according to plans laid before the Honourable the Minister of Public Works by the Harbour Commissioners of Montreal, and transmitted to us, would be detrimental in causing or increasing the floods which take place at and opposite Montreal.

We have carefully considered the question, and are of the opinion that the proposed works would not be detrimental in the sense mentioned, that is, that they would not have any appreciable effect in either causing or increasing floods at or opposite Montreal.

We have the honour to be, Sir,

Your obedient servants,

THOS. C. KEEFER.
HENRY F. PERLEY.
JOHN KENNEDY.

MONTREAL, 11th May, 1888.

The undersigned does not join in the above report of the Flood Commission, because the question now submitted on behalf of the Montreal Harbour Commissioners does not embrace the consideration of the permanent dyke which must be erected in connection with their work.

PERCIVAL W. ST. GEORGE.

A. GOBEL, Esq.,
Secretary, Department of Public Work,
Ottawa.

THE TAKING OF THE ICE IN THE ST. LAWRENCE, IN THE WINTER OF 1886 AND 1887.

The "taking of the ice" in the fall of 1886, may be said to have begun about the 1st December. During the last week of November, thin and narrow bordages had been forming along the shores. These, broken off by the rising water, formed streams of ice which skirted the shores and accumulated as they descended the river.

LAKE ST. LOUIS.

On the 2nd December, the "ice took" out, from the north shore to the Pointe Claire, and Valois light-piers. On the 5th the ice had closed across very nearly if

not quite from Beauharnois to Ile Perrot, and had extended in other parts of the lake. On the night of the 6th, Reid and Fleming's tug was frozen in at the wharf at Lachine. An ice bridge had taken across from the north shore to the head of Ile Dorval, and in general, on both sides of the lake, below Chateauguay and the Dorval Islands, down to the rapids, the bordgages had formed out to their usual winter limits. All that portion of the lake above a line running from Valois Bay to the upper entrance to the Chateauguay River was frozen over, with the exception of an opening up through the main steamboat channel. This open channel was about a mile wide for about four miles of its length towards its lower end; but became very narrow, if not quite closed across, opposite Beauharnois. The channel, as well as the other open water of the lake, was nearly covered with floating ice; on the 6th the sheets formed on the running water below the closed parts of the lake, being one-eighth to one-quarter of an inch thick, when they reached the Caughnawaga ferry crossing. The ice was shoved up on the upper end of Ile Dorval about four feet high, the shoves being composed chiefly of ice two to three inches thick. There were light shoves along the bordgages on the upper side of points and at the light piers. The bordage along the shores and between Caughnawaga and Chateauguay River was composed principally of cakes that had been driven and frozen together. On the 7th the temperature was about zero Fah.; there was very little ice passing Lachine and the sheets were less than one-quarter inch in thickness. On the 8th the bordage ice at Dorval was seven inches thick, and in the lower part of the lake, where not shoved, twelve inches was the greatest thickness found. The ice had cracked and moved slightly while "taking" in the vicinity of the light-piers, opposite Valois, and a few cakes were shoved up along the lines of fracture, and especially on the upper ends of the piers, in cakes from one inch to three inches in thickness. The ice was smooth in the upper part of the lake. On the 9th soft weather set in and continued until the 15th. During this thaw considerable change took place in the outline of the ice. An area about two miles long, by one and a-half miles wide, or three square miles, broke off at Pointe Claire light-pier and a channel three-quarters of a mile to a mile wide opened up through the lake, opposite Beauharnois, to the Cascade Rapids on the 14th, breaking off about five or six square miles of ice. In addition smaller pieces broke away along the other bordages, so that during this thaw about ten square miles of ice passed down from Lake St. Louis. This ice was about six inches to nine inches in thickness. The return of the cold weather was well marked in the lake on the 16th and 17th. The channel opposite Beauharnois was being narrowed by broken ice one-quarter inch thick to one and one-half inch thick, in cakes, being shoved along the south side, freezing together and forming rough ice, the cakes standing about two feet high. At two hundred and fifty feet from the end of the bordage the new ice was one and one-half inches thick, at five hundred feet it was six inches thick. The open channel here was about three-quarters covered with floating ice. On the 17th a strong west wind was blowing, the bordage was being rapidly broken off and in the afternoon the river opposite Lachine was covered with moving ice. With continued cold weather the bordages in the upper part of the lake increased, and on the 27th the ice had closed above and reached down to a line running from Pointe Claire across to a point about one mile above the upper entrance to the Chateauguay River. A period of very cold weather followed the 27th December, and on the 6th January the space of open water had contracted considerably opposite the Chateauguay River and Valois Bay. The upper end of the open channel reached a line running from the mound at Chateauguay to Pointe Claire church, but the last mile at the upper end of this channel was reduced to a width of about eight hundred feet. The ice had also extended at the light-piers opposite Dorval, and had formed over a large portion of the shallow water opposite the lower entrance to the Chateauguay River. When the ice "took" across the channel opposite Beauharnois, after the thaw of the middle of December, it might be said to have settled down to its winter regime, for the principal change which afterwards took place was the gradual closing down of the ice from this point. This process continued during the greater part of the winter,

and on the 1st of March the ice had extended downward nearly to a line extending from the mound at Chateauguay across to the head of Ile Dorval, thus closing a space of about three square miles that was open on 6th January. The ice did not extend further down than this line, and according to the account of residents along the shores, was later than the average in assuming its usual winter outline.

Observations establish the facts; that nearly constantly during the winter ice is passing down opposite Lachine, that the proportion of open water covered with this moving ice is occasionally very small, but in general varies from one-eighth to nearly the whole surface; that three kinds of ice pass down, viz., cakes of various sizes broken off the bordages by wind and waves, frazil from the bottom which floats down in snow-like masses, and sheets of thin ice formed on the running water as it moves along. These latter sheets vary in size from twenty feet to two hundred or more across and are in general one-eighth of an inch to one-quarter of an inch thick when they reach the Caughnawaga ferry crossing, but in some cases are one inch thick. As an instance, the sheets were reported one-eighth of an inch thick on a day when the thermometer read 15 degrees Fah. above zero, and on another day with the thermometer at 5 degrees the water at the ferry crossing was three-quarters covered with large sheets, one inch thick, also a quantity of frazil is reported as coming down the same day. On mild days, large quantities of frazil rise from the bottom, and on days with high wind the bordage ice breaks off in varying quantities.

On the 5th January the temperature was about 7 degrees Fah. above zero and very little frazil was running. On the 6th the maximum was 24 degrees above and the minimum 17.8 above. A few lumps of frazil were seen on the Caughnawaga side, and on the Lachine side the surface was about half covered. There was also surface ice running in sheets about one-quarter of an inch thick. On the 14th and 15th January the temperature was about zero. On the latter date at the Caughnawaga ferry crossing the water was almost half covered with moving ice in large sheets, one-quarter inch to one inch thick, and underneath in many places there were masses of slush (frazil). The direction of the currents of floating ice coming down the lake was always towards Lachine, the south shore being freer from moving ice than the north, but the greater part passed down the middle. On the shoals below Chateauguay Point masses of ice accumulated and were swept away alternately during the winter.

On the 14th January the current of the branch of the Ottawa River at Vaudreuil became reversed, owing to the channel of the St. Lawrence between Beauharnois and Ile Perrot having become obstructed by frazil. The current thus reversed continued to flow northward until 19th April, when it returned to its normal direction.

LACHINE RAPIDS TO THREE RIVERS.

Very cold weather set in about 2nd December and the ice joined across from Moffatt's Island to the St. Lambert shore, above the old Grand Trunk Railway piers, excepting a narrow channel which still remained open from the outer end of the east abutment of the Victoria bridge to the second and third sluices from the St. Lambert shore. On the 3rd, the weather was very cold and nearly the whole surface of the river opposite Montreal was covered with floating ice. From a distance, this ice appeared to be composed of broken cakes, but on closer observation it proved to be aggregations having the appearance of saturated snow cemented together, or coated over with sheets of ice of varying thickness. These aggregations varied in superficial area, but were chiefly from 10 square yards area to areas of a few square feet, with intervening spaces of open water. The portion of the water surfaces not occupied by these masses, was, in general, coated with a very thin film of ice, about one-hundredth of an inch in thickness, not perceptible except by a suitable reflection of light. This film when it meets with any obstruction, or rough water, or a strong wind, is broken into cakes or ground into small fragments, according to the amount of agitation or crushing to which it is exposed; carried downward with the current, it is drawn under fixed ice, or is attached to the masses already formed, or forms the

nucleus of new masses ever thickening, and extending in area as they descend the stream. This thin film of ice when taken in the hand and squeezed, assumes the appearance and imparts a feeling nearly like saturated snow. Mile after mile of it is being momentarily formed in very cold weather to be broken or ground into slush ice, or thickening in places on smooth parts of the river, (to be borne onward in large sheets until broken into cakes in contracted parts of the channel).

Lake St. Peter was now almost covered with large sheets of moving ice. These, on reaching the contracted section of the river at Port St. Francis, were broken into cakes which lodged on the shoals, or were carried by the stronger current down the main channel. On the morning of December the 4th, a bridge formed from the mouth of the Nicolet River, across the Iron Shoal to Pointe du Lac. This was the first taking of the ice across the St. Lawrence in the winter of 1886-1887. The ice at once began its march up stream, packing against the bridge and bordages, but growing most rapidly in the slack current in the middle of the lake. At the head of the lake the stronger currents issuing from the channels between the islands carried the heavier pieces of floating ice from the river above down into the thinner ice in the lake, forming tongues of shoved ice, the principal one being down the present ship channel and a narrower one down the straight channel dredged in 1841 to 1847. The ice stopped moving at Stone Island on the evening of the 5th and opposite Sorel at 8 a. m. on the 6th. There was heavy shoving in the ship channel at the islands below Sorel, also, in the channel north of Ile de Grace and at the entrance to the Corbeau channel. The ice was piled in many places five feet above the water, the highest piles being at the bordages. The "shoves" were composed of ice from three inches to six inches thick. The ice "took" smooth, i. e. without packing, in nearly all the small channels on the Berthier side of the river. The Corbeau channel remained open nearly its whole length and there was a long wide air hole; north of Ile de Grace. Farmers in the neighbourhood say these often remain open nearly all winter. There were a few smaller "air holes" among the islands. On the afternoon of the 5th, the ice formed in the main channel at Port St. Francis, was three and one-half to five inches thick and it was strong enough for horses to cross on the 6th. At St. Lambert on the 5th, the bordage extended out to the end of the Victoria Bridge east abutment, thence across to the head of Moffatt's Island and the outer points of the old wharf, thence skirting the shallow area of St. Lambert channel and the comparatively still water below to the outer end of Longueuil wharf and thence by a narrow neck of ice to the head of Boucherville Islands, although the open water of the Boucherville channel extended close along shore up nearly to the lower limits of Longueuil. There was shoved ice along the bordage between the east abutment of Victoria Bridge and the head of Moffatt's Island and the flow of water east of the island seemed to be greatly diminished, as the water just above the old piers lowered about eighteen inches. The channels between the Boucherville Islands were frozen over and the group was surrounded by a bordage of varying width, but extending to a considerable distance where there is shallow water or a slack current. In Laprairie Bay, on the east side from Laprairie downwards to Victoria Bridge, a bordage was formed. This bordage, of one thousand or two thousand feet in width at points and wider in bays, formed in the first days of the severe frost, but afterwards extended only slowly until the final closing of the bay by the ice pack. On the shallow area, below the west abutment of Victoria Bridge bordage ice formed early also, but did not increase much in width until the river filled by packing. There was a great quantity of ice floating down on the 5th, and the ice, having stopped at Sorel at 8 a. m. on the 6th, was not moving three and a-half miles above at 1 p. m. The forward edge of the moving ice formed a V shaped ridge with the point down stream in the middle of the river, and near this edge the ice was moving about one foot per second. The south shore bordage was one hundred to three hundred feet wide from Sorel to Lanoraie. At five miles above Sorel the ice was moving fast on the south side, but was nearly stationary in the middle and on the north side. Above this point there were large fields of ice, but they were being broken up into rough ice as the blocking ascended. The rate of the flowing ice here was about one and a-half miles per hour, but very

variable, owing to crushing and jamming. At six miles above Sorel there were patches of clear water two hundred to three hundred feet long by fifty feet to sixty feet wide. From Lanoraie to Lavaltrie the river was full of floating ice, very much shoved and moving down slowly. There was considerable clear water in the St. Ours Channel, with fields of smooth floating ice. The edge of the south shore bordage crossed the Bell mouth and passed about six hundred feet south of the buoy at the middle of the Contrecoeur channel to the iron buoy at the upper end. The general direction of the ice from the lower end of Ile Bouchard was towards the Lanoraie Channel. From the lower end of Ile Bouchard up to Verchères the bordages were very narrow and the water surface was nearly covered with field-ice, which was moving down at the rate of one and one-quarter to two miles per hour.

The weather continued very severe, and on the 7th the quantity of floating ice had increased. The river just above Longue Pointe, as seen from the south shore, appeared almost covered; opposite Varennes, where the current is strong, it was about half covered; opposite Cap St. Michel a wide expanse of open water stretching towards Repentigny was about half covered with moving areas of ice, which were aggregations of frazil covered over and made continuous by new ice. These were, in general, rounded or elliptical surfaces, twenty-five to one hundred feet across. Downward towards Verchères, a greater proportion of the surface was covered about three-quarters. The ice "took" at Verchères on the 9th at noon. The St. Lambert Channel had become closed across to St. Helen's Island and Ile Ronde, and the bordage extended out about one thousand feet beyond the end of Longueuil Wharf. The neck of ice that had connected the upper end of the Boucherville Islands with the bordage at Longueuil had broken through, and there was an open channel from the river above into the Boucherville Channel. The bordage along the south shore below Longueuil and in the Boucherville Channel was one hundred to three hundred feet in width, and on the side of the Boucherville Islands towards the main channel the bordage was much wider, stretching out over the shallow area towards the north shore. For a width of about three hundred feet along the outer edge of the bordage there was shoved ice, the points of the cakes standing about three feet high with a mattress of cakes of ice and frazil cushioned underneath to a depth of six feet below the water level. The open water here was about half covered with floating fields of ice aggregated into floes of various dimensions with thin films of ice ever forming on the intervening spaces. The thickness of the ice on the small channel running across the head of Ile de Gros-Bois was found to be just nine inches on the 9th December. This may be taken as a good example of the thickness of ice formed in this locality from the beginning of winter, as there is but little current here the ice "takes" with the first hard frost and remains undisturbed until spring. The channel north of Ile Ste. Thérèse closed across about this time. From Pointe aux Trembles (en haut) to Montreal, on the north shore, the bordage was narrow, and the open parts of the river in general at this time presented a rectified channel, the bays being filled out by broad bordage, while open water was still maintained close to points, but where the main channel of the river sweeps around a bay close to shore, as between Longue Pointe and Pointe aux Trembles (en haut), the bordage remained narrow.

The temperature began to rise on 9th December, and mild weather continued during the 10th, 11th, 12th, 13th and 14th, and cold weather again set in on the 15th. Although there were short intervals of high temperature accompanied by rain, later in the season, this was the only well-marked thaw of the winter of 1886 and 1887. During this thaw general and rather extensive movements of the ice took place over the greater part of the river not already closed across.

There was no movement of the ice between the lower end of Lake St. Peter and the upper end of the islands opposite Sorel during the thaw, except a movement of twenty to thirty feet down stream on the small channels opposite Berthier, but the water rose over the ice along the shores between Sorel and the lake. On the 11th there was a heavy movement of ice between Lanoraie and the islands at Sorel. A fracture ran across from Lanoraie, inclining up stream

towards the south shore. Below this line the ice moved down stream about one-third of a mile, causing heavy shoves on shore, and along the edge of the bordage where the ice parted, and shoving up piles of ice ten to fifteen feet high on the upper end of Ile St. Ignace. This shove made an opening opposite Lanoraie, which afterwards contracted and changed in form, but remained open as an air-hole all winter. The shove started about 10 a.m., and had stopped before noon. There was an unimportant movement of the ice at Contrecoeur the same day (11th). Having stopped at Verchères on the 9th, at noon the ice had become stationary some distance above, when thawing began, and the thaw seemed to produce very little effect in this vicinity. The ice road was made at Verchères on the 11th. Between Verchères and Montreal the movements of the ice appeared chiefly in changes of the bordages on the south shore from St. Helen's Island down to the Boucherville Islands. The ice moved down about one-quarter of a mile from a fracture that ran from the middle of St. Helen's Island across to the south shore. The opening to the Boucherville Channel closed, and the ice shoved up slightly on the upper ends of the island, and about eight feet high on Longueuil wharf. Along the north shore there were slight movements, and the ice piled five feet high on Longue Pointe wharf; an examination of the ice among the islands and in the ship channel, between Sorel and Lake St. Peter, 15th to 20th December, showed that there was a great variation in thickness. Among the islands the thickness was seven inches to fourteen inches, and in the ship channel six inches in the middle to ten inches and fourteen inches near shore. The ice of Chenal du Moine was smooth and fourteen inches thick.

On the return of cold weather the surface of the open water again became coated with floating ice. On the 16th December areas, two hundred feet long by one hundred feet wide, of aggregated frazil, coated over with a smooth sheet of ice, were floating past Montreal. Opposite Longue Pointe the water was nearly covered with floating ice, which was crowded together at this narrow part of the channel. Between Longue Pointe and Pointe aux Trembles (en haut) the surface was about three-quarters covered. At the last mentioned place at 4 p.m. the river was full, and the packing ice between the bordages was moving down very slowly. The large floes as they approached the packing ice were broken into cakes of convenient sizes, to be tilted on edge and packed irregularly.

The water at Hochelaga and Pointe aux Trembles was fluctuating one foot to one and a-half feet, indicating the approach of the pack. In fact the river had become full at Varennes about noon, and the packing and working of the ice there lasted about four hours, when it became stationary.

The ice road at Varennes was made on the 18th. The ice filled up rapidly, and on the 17th the upper part of the Boucherville channel closed, but a long "air hole," extending from a point about one mile above Boucherville village to the lower end of Ile de Gros Bois, formed and continued open during the whole winter, gradually filling, however, from the lower end nearly up to the village. The main river from Hochelaga downwards was full of packing ice, which was moving very slowly at Longue Pointe and became stationary there on the 18th, but did not become solid at Hochelaga until the 29th. A period of mild weather, from the 18th to the 24th, with temperature from 20° to 34° Fah. above zero, no doubt delayed the taking of the ice in this vicinity.

The following diary gives details of the ice phenomena during this period at Montreal:—

MONTREAL, Saturday, 18th December, 1886.—River running full of frazil to-day.

MONTREAL, Tuesday, 21st December, 1886.—In the morning the river was full of ice up to the jail, and ice seemed stationary. In the afternoon it was full up to Monarche street. Very little frazil running down in the open water.

MONTREAL, Wednesday, 22nd December, 1886.—This morning there was open water down to the Longueuil ferry. This afternoon open water extends as far down the river as can be seen standing on Hudon's wharf. Very little frazil running down this morning. There was more in the afternoon, though not a great quantity. Crossing at Longue Pointe not interrupted.

MONTREAL, Thursday, 23rd December, 1886.—Very little frazil running down opposite the city, also very little running down at Lachine.

MONTREAL, Friday, 24th December, 1886.—Water still open below Hochelaga.

MONTREAL, Saturday, 25th December, 1886.—In the morning open water extended a considerable distance below Hochelaga. There is a very great quantity of frazil running down opposite the city, a greater quantity than observed previously.

The frazil is aggregated into great areas, and coated over with quite a strong coating of ice, apparently one inch to one and a-half inches thick. These large areas are grinding and breaking up cakes along their edges, and along their line of contact with the bordage ice, as they pass down the rapid current opposite Moffatt's Island.

MONTREAL, Sunday, 26th December, 1886.—River closed up on sides nearly to Victoria Bridge with a V shaped opening, extending down the current nearly to the upper end of Moffatt's Island.

There appears to be a large increase of bordage ice in the lower parts of Laprairie Bay since the soft weather of the 24th inst.

MONTREAL, Monday, 27th December, 1886.—River gradually closing up towards Victoria Bridge.

MONTREAL, Tuesday, 28th Dec., 1886.—Open water extends considerably further down from Victoria Bridge than it did yesterday, having opened during the extensive shove which took place about 2 a.m. to 4 a.m. this morning. All along the south shore from the Victoria Bridge to the toll gate below Longueuil, shoving occurred. On the upstream side of points of the shore, the ice is shoved up to the level of the top of the banks, the openings at the old St. Lambert wharf are all closed, the opening which extended from the head of St. Helen's Island to Coteau Rouge road is closed, the opening running from Isle Ronde across to the south shore is closed except where it was widest, large cakes of ice are shoved upon and over Longueuil wharf, and an opening is made below the wharf, beginning about three hundred feet below and extending down to the toll gate. It is close to shore and about three hundred feet wide towards the upper end. The opening which existed at the head of the Boucherville Islands is closed and the ice between Longueuil wharf and the Boucherville Islands is considerably shoved, without, however, any very high piles.

MONTREAL, Wednesday, 29th December, 1886.—This morning open water extends a short distance below Victoria Bridge, about one-third way down to head of Moffatt's Island in the central parts of the river; but the ice is closing in rapidly from above and appears almost closed across at a short distance above the bridge.

MONTREAL, Thursday, 30th December, 1886.—There is an air-hoie near the east abutment, and another near the west abutment of Victoria Bridge, but as far as can be seen from the Harbour office cupola at noon, Laprairie Bay seems to be closed. The air holes at Wind Mill Point still remain open; began making St. Lambert upper road to-day.

Thus the harbour finally became filled and solid up to the Victoria Bridge on the morning of the 29th December, and then the closing progressed rapidly up Laprairie Bay, reaching Laprairie Village in about thirty hours, and the foot of the rapids soon after.

Observations of water levels from Verchères to the foot of Lachine Rapids show that in addition to the gradual rise which takes place as the bordages increase, and the river becomes filled with ice, a special rise accompanies the taking of the ice as it becomes stationary from point to point and within a short time after the ice has "taken" the water falls about two feet.

As partly stated before, the ice forms early around Laprairie Bay and around Nuns Island, extending upwards on the low flat islands and shoals above the island, but afterwards the bordages extend slowly, and an average area of about nineteen square miles remains open in the bay until filled by the ascent of the ice pack from below, thus maintaining for a long period (about twenty-eight days in December, 1886) an enormous manufactory of frazil.

An examination of the ice on Lake St. Peter on the 6th, 7th and 8th of January, between the Yamaska River, on the south shore, and Rivière du Loup, on the north,

showed that it was about twelve inches thick in the middle of the lake and sixteen to eighteen inches thick towards the shores. A crack about six inches in width extended round the head of the lake, and down the north side towards Yamachiche. This crack usually exists in the lake near the same locality and varies from four feet wide to an overlap of some feet, thus showing contraction and expansion of the ice through several feet.

THREE RIVERS TO THE PLATON.

The stream of ice formed by broken off bordages, that had been forming in the last week of November, 1886, reached a width of a-quarter of a mile along the south shore at Cap à la Roche on 1st December. Very cold weather then set in, the quantity of floating ice increased and the fixed bordages extended rapidly and were well marked along the main shores and around islands on the 5th. At Cap à la Roche the bordages were three hundred to four hundred feet wide, the south shore batture was covered with lodged ice, and ice was beginning to lodge on the north shore batture, and the river was running nearly full of ice. The river here was full of ice, also on the 6th, and the bordages were from four hundred to seven hundred feet wide. On the 7th the general features were similar, the ice was lodging on both battures at Cap à la Roche and the bordages were wide below Cap Charles. Cold weather continued and the bordages in general rapidly encroached on the open channel. On the 9th (the beginning of the thaw) there was not much ice running at Cap à la Roche, but the bordage extended from the north shore nearly to the new channel and below Cap Charles, and at Cap Levrault the bordages were within about six hundred feet of joining.

Writing from Leclercville, which is a short distance above the Richelieu Rapid, the Hon. H. G. Joly states:—

"December (1886) has been unusually cold and stormy, but the battures settled down pretty early and after a few disturbances in the beginning of the month they assumed their usual proportions, extending to the channel from both shores." This remark applies in general to the river below Cap à la Roche. Large quantities of ice in large fields continued to pass the Platon. A temporary bridge "took" at the head of the Richelieu Rapid on the 11th December, caused by a large field of ice from the Grondine Shoals which, having become detached, floated down and jammed between the batture bordages. Although rain was falling and the temperature was above freezing point, the bridge held for a whole day, but a severe north-east storm carried it away the following night. Report from the neighbourhood states this to be the earliest ice bridge known there.

Little ice was floating down at Cap à la Roche or the Platon during the thaw, but large quantities in large fields again appeared on the return of cold weather on the 15th December, and in the afternoon the ice again stopped opposite Leclercville, but passed out during the night. On the 25th the open channel between Three Rivers and Cap à la Roche occupied about half the width of the river, but was of nearly uniform width, the bays being filled out with wide bordages. About three miles below Cap à la Roche the open channel began to contract, and at Richelieu Island it was only about one thousand feet wide. There were large stationary areas of ice around the ice piers, opposite Cap Levrault, and at the Cadieux Shoal, opposite Grondines, also in the vicinity of the Richelieu Rapid. There is nothing to note but the continued descent of large fields of ice until the 28th to 30th January, 1887, when the weather was mild and there was little ice running. On the 2nd February the ice bridge "took" at the Platon. The bridge was made by a large area of floating ice becoming jammed between the batture bordages at a point about one mile above the Platon wharf, where the south shore batture makes out furthest, terminating in a point at a large rock known as *la roche d'Oiseau*. The river immediately cleared below and the bridge grew rapidly up stream, reaching Domaine Mill about two miles from the quay, on the 4th. Residents at Portneuf, immediately opposite, report it to have been the grandest in many years. On the 5th the bridge had reached the Richelieu light, having ascended a mile in twenty-four hours.

On the 6th there was a snow storm without wind, and the ice took across the river above the Richelieu Rapid in the vicinity of Leclercville, although there was an open pool opposite the village, with stationary ice below and above. The weather was very cold and the ice gained up stream rapidly without heavy packing. On the evening of the 6th it reached Grondines and was opposite the wharf at Cap à la Roche the following morning, and reached Batiscan on the evening of the 7th, thus making up stream twelve miles in twenty-four hours. The taking process continued upward until it reached Port St. Francis at the lower end of Lake St. Peter, where the ice first took on the 4th December, thus completing the closing of the St. Lawrence, so far as it closed in the winter of 1886-87.

To review: The ice took at Nicolet, the lower end of Lake St. Peter, the morning of the 4th December. At Stone Island, the upper end of Lake St. Peter, in the evening of 5th December, thus travelling upward about twenty miles along the lake in thirty hours. It took at Sorel at 8 a.m. on the 6th, making the distance from Stone Island, seven miles in fourteen hours. It stopped at Verchères on the 9th at noon, making the distance from Sorel, twenty-three miles, in seventy-eight hours, thus making an average of fifty miles in one hundred and two hours, or nearly 0.5 miles per hour. Soon after the pack reached Verchères its progress was arrested by soft weather. On renewing its upward march it reached Varennes and became stationary there at 4 p.m. on the 16th December, thus an interval of seven days was occupied in closing nine miles. The ice stopped at Longue Pointe on the 18th, thus occupying about two days in closing up from Varennes, a distance of seven and one-quarter miles. The river was now full of floating ice up to the foot of St. Mary's current, but the ice did not take at Hochelaga until the 29th, or eleven days after taking at Longue Pointe, about four miles distant. This interval included a few days of high temperature, during which the ice did not progress up stream. The ice became stationary in the vicinity of Moffatt's Island a few hours after it became solid at Hochelaga, about three miles distant. The river was closely packed with ice opposite the city for several hours before the cakes stopped moving. The "taking" from Victoria Bridge to Laprairie Village, four miles, occupied about thirty hours, or at the rate of about a mile in seven hours, and the taking reached the foot of the Lachine Rapids early on the 31st December, 1886. On Lake St. Louis the ice nearly or quite closed across opposite Beauharnois on the 6th December, but opened again and closed finally about the 18th, and from this point the solid ice gradually grew downward to the points before described. North of Ile Perrot the lake closed about the 5th December. The rate of progress of the ice upward to Lake St. Peter after taking at the Platon on the 2nd February, 1887, has been before detailed. The ice roads were begun immediately after the ice became stationary at the various points except at the Platon and Leclercville, where tides exist, and a period is allowed to ensure the safety of the bridge. The bridge between Leclercville and Grondines was put in order for traffic on the 14th February. The ice was found to be eighteen inches thick in mid channel here on the 31st March.

The ice after settling into its winter regime presented fewer air holes than usual, especially in the vicinity of Montreal. The "air-hole" which very generally exists in St. Mary's current was absent. An air hole usually exists at the lower end of Wind Mill Point wharf. This smaller than usual developed after the ice "took," but again closed during the winter. An air hole existed all winter in the rapid part of the current east of St. Helen's Island, and a small air hole was open all winter at the end of each abutment of the Victoria Bridge. A small air hole which at first formed on the south side of Laprairie Basin, at a point about one mile above the bridge, closed during the winter. Very little open water, if any, was left in Laprairie Bay, and the ice closed up to and for some distance into the rapids.

Downward an air-hole remained open in the Boucherville channel. One opposite the low light of Ile Ste. Thérèse, upper range, at Ile aux Vaches, one at Cap St. Michel, two or three very small ones in the vicinity of Ile de Bellegarde and Harpelle Island; one opposite the church at Lanoraie; a small one opposite St. Pierre les Becquets; one opposite Grondines village, and a long one in the Richelieu Rapid.

The ice did not take below Platon Point. The whole main channel of the river was packed ice, but there was not very heavy fall shoving, in fact the ice shoves formed by the "taking" process seemed rather below than above the average. The "pack" just above Platon Point, however, was an exception. It was truly tremendous, and as late as 9th April presented an area of two square miles or more of ice, piled to an average height of five feet above the smooth ice surface, and snow with special piles reaching ten feet high. Even the smoothest parts of the ice there (which did not appear at all shoved being covered with snow) were underlaid with twelve feet or more of frazil and anchored blocks of ice. Excepting that in general air-holes, especially in moderate currents, contracted in size, closing up from the down stream end, very little change took place in the aspect of the river during the winter. Air-holes which closed partially or wholly during the very cold weather, reappeared when the spring thawing began. Air-holes, uniformly present a blunt, pointed or semi-elliptical form at their down stream end, and usually a similar form at the upper end, but sometimes have the shape reversed at the upper end, the ice hanging down in pointed leaf-like extensions, the general outline being approximately parallel to the lower end. Air-holes in the vicinity of Montreal, when observed, were found to have a continuous stream of frazil passing through, varying somewhat in quantity, and the observations were numerous enough to warrant the inference that during the whole winter there is a constant stream of frazil passing under the ice in the vicinity of Montreal. From the surface of air-holes in general heavy clouds of vapour rise during low temperatures, especially from agitated parts of the river, such as the St. Mary's current. From this current and its vicinity on a very cold still day in December, immense volumes of vapour were rising. The vapour did not rise from the water in uniform clouds, but collecting at various intervals of distance rose in gigantic misty columns, to the height of a quarter of a mile, then spreading and connecting into soft arches before vanishing.

The ice which forms on air-holes seems to vary somewhat in character, with varying temperatures of air. That formed on a very cold day appears uniform on the surface, as a thin film near the upper end of the opening, thickening rapidly as it floats downward, while that formed in a temperature of 15° to 20° above zero sometimes assumes a mesh like appearance with ribs of ice and intervening open, angular spaces.

THREE RIVERS GAUGE.

Taking of ice, Season 1886-87.

The water at Three Rivers, which had stood at about three feet above low water since the 1st January, 1887, rose about one and a-half feet between the 22nd and 24th, and then remained nearly steady but going down until the 5th of February, when the ice had closed up from the Platon to the Richelieu Rapid. The water then began to rise rapidly and on the 12th had risen about five feet and one-half, or stood about nine and one-half feet above low water. The ice took at Three Rivers on the 12th. After the ice became stationary the water fluctuated but little, gradually going down, however, until 5th April when it stood at about seven and one half feet above low water. Low water at Three Rivers is taken at the lowest level of water observed on 19th September, 1881. This point is given by the Department of Public Works as 3.69 feet above the lower lock sill of old Lock No. 1, Lachine Canal, or 15.31 feet below ordinary summer level of 19 feet on sill at Montreal.

SOREL GAUGE.

Taking of Ice, Season 1886-87.

The water did not begin to rise at Sorel until the ice took at the lower end of Lake St. Peter, on the night of the 4th December, when it stood at one and one-half feet above low water. It then began to rise rapidly and had risen two feet eight inches, when the ice took at Sorel, on the morning of the 6th. On the 7th it had had an inch, but then began to rise and rose steadily until the 11th, when it had

risen one foot five inches, i.e., it stood five feet six inches above low water. It then lowered slightly, but rose again and stood one inch higher on the 14th December. From this date it lowered, fluctuating, however, through about one foot until the 5th February, when it had fallen about one foot six inches, or stood four feet one inch above low water. The ice which had taken at the Platon on the 2nd February, reached the Richelieu Rapid on the 5th, when the water began to rise at Three Rivers. It also began to rise at Sorel on the same date, and rose steadily until the 7th, when it had risen five inches and the ice had taken up to Batiscan. It then began to rise much more rapidly and rose until the river closed up to Three Rivers on the 12th February, when it had risen three feet one inch more, or stood at seven feet seven inches above low water. It fell about two inches, but rose again on 18th February, stood about six inches higher than on the 12th. From this point it began lowering gradually though fluctuating, through about one foot until the 1st April, when it had fallen one foot five inches from its level on the 18th February, or stood at six feet eight inches above low water. It remained nearly at the same level until the 5th April, when it began to rise gradually. On the 11th it stood at eight feet above low water. From this date the rise was more rapid and the rate, though not quite uniform, presented no marked fluctuations until the water reached its highest point, fifteen feet six inches above low water on the 24th April, it then fell rapidly until the 29th, when it stood twelve feet six inches above low water. The ice gave way about this time at Longue Pointe, and the water rose at Sorel to thirteen feet six inches above low water on the 30th, but immediately began to recede.

VARENNES GAUGE.

Taking of Ice, Season 1886-87.

When the ice took at Varennes, which was on the 16th of December, 1886, the water was eleven feet three inches above low water.

BOUCHERVILLE GAUGE.

The ice took at Boucherville on the 17th of December, 1886, with the water eleven feet five inches above low water.

MONTREAL (HARBOUR OFFICE) GAUGE.

The ice took at Montreal on the 29th December, 1886, with the water sixteen feet eleven inches above low water.

LAPRAIRIE GAUGE.

The ice took at Laprairie on the 30th December, 1886, with the water about nine feet above low water.

NOTE.—Low water at all places between Three Rivers and Lachine. Low water is taken as the river surface, when the river is at such a stage as to stand at eleven feet on the flats of Lake St. Peter, or seventeen feet on the lower sill of old Lock No. 1, Lachine Canal.

MEMO. TEMPERATURES, AIR, WATER AND FRAZIL.

Date 26th February, 1887. Time, 1.30 to 2 p.m. Reading of thermometer opposite Caughnawaga in open water about 1,000 feet from bordage ice, at surface or at any depth to 15 feet, $32^{\circ}3$ F.— $1^{\circ}5$ —corrected, $31^{\circ}8$ F., also when weighted and settled into frazil at bottom (15 feet depth), and allowed to remain there five to ten minutes, reading the same; corrected, $31^{\circ}8$ F., bulb probably settled into frazil four inches. Frazil 0 to 4 feet or more depth on bottom. Observed within easy range of vision during two hours and a half. Seven masses of frazil rise from the bottom. Temperatures taken in the open running water.

Air temperatures in degrees F., at McGill College Observatory.

Time.	Hours.											
	1	3	5	7	9	11	13	15	17	19	21	23
1887.												
February, 25.....	7.6	3.0	-1.1	-2.6	-0.3	3.8	4.8	6.8	5.0	3.6	3.7	4.5
do 26.....	0.0	-4.0	-2.6	-4.0	-8.4	0.0	8.7	10.8	10.0	20.4	21.8	23.2
do 27.....	23.0	32.9	28.2	26.8	26.9	27.0	24.9	22.5	20.0	18.0	14.5	12.9
do 28.....	9.6	6.0	-2.0	-1.8	0.8	2.8	4.9	7.8	7.8	3.7	2.4	4.0
March, 1.....	3.0	-1.0	-6.5	-5.9	1.4	5.7	6.6	7.3	6.2	4.0	5.1	5.4
do 2.....	5.6	8.6	13.0	17.3	20.5	21.9	18.7	22.0	21.0	23.7	20.6	17.5

Date, March 1st; time 10:30 a.m.; temperature at same place and positions as on 26th February, found the same, viz.: 31°·8 F.

Observed two masses of frazil rising in one hour.

Temperature of water taken through the ice in the channel of Lake St. Louis, depth of water 31 feet; about one mile above Chateauguay, time 3:30 p.m., 1st March, was at any depth 31·8 degrees F. to 31·9 degrees F., seeming to be slightly higher than in the open water opposite Chateauguay at 10:30 a.m., but it was difficult to read with certainty to one-tenth of a degree at the positions 32·3 degrees and 32·4 degrees on the scale where the thermometer stood uncorrected by 0·5 degrees. Thermometer tested within a few days of taking these observations by Prof. C. H. McLeod, of McGill College Observatory, and correction given as 0·5 degrees, also tested by standing in a tub of frazil and water in the basement of the Harbour Commissioners' building for three hours and reading it at intervals, the reading being always 32·5 degrees, this giving a correction of 0·5 degrees.

So far as these observations of the temperature go, they appear to show that the temperature of the open water and the frazil on the bottom opposite Caughnawaga was, at the time of observation, slightly below 32·0 degrees F.

It is seen from the air temperatures given that the weather was variable and that high temperatures occurred not long previously to the time of observation and at the hours of observation the air temperature was rising and frazil was rising from the bottom. It is therefore not improbable that during a long interval of frost and before the temperature began to rise there might be found lower temperatures in open water and frazil than those here recorded.

The thermometer used in these observations was enclosed in a water-tight tin tube, with glass face, and valve in bottom, so that it could be brought up full of water, from any desired depth and read before the enclosed water was appreciably affected by the temperature of the air.

TABLE giving duration and mean degree of Winter Frost for 47 Winters, also Winter and Spring High Water and Flood Years for 37 years.

Winter Season of	Number of Days that Mean Monthly Temperature remained below 32° F.	Number of days shorter or longer than the average of 48 Years, viz., 132.2 days. S = shorter, L = longer.	Number of Degrees below 32° (derived from Monthly Means) reduced to the average of 132.2 days per season.	Number of Degrees above or below the average, viz., 12.9°, of 48 Years for 132.2 Days per Season.	Winter High Water, i.e., at taking of ice, on Sill of Old Lock No. 1, Lachine Canal.	Height above or below the Mean of 39 Winter High Waters, viz., 34.7".	Spring High Water, i.e., at breaking up of ice, on Sill of Old Lock No. 1, Lachine Canal.	Height above or below the Mean of 37 Spring High Waters, viz., 34.9".	Remarks.
Jan. '38					40 7	6 0			Highest winter flood.
1838-39	148 2	16 0 L	13 2	-0 3					
1839-40	138 1	3 9 L	10 4	+2 5	38 1				
1840-41	145 2	13 0 L	14 0	-1 1	40 1	5 6			Winter flood.
1841-42	134 6	2 4 L	11 7	+1 2					
1842-43	136 1	3 9 L	13 4	-0 5					
1843-44	128 6	3 6 S	13 2	-0 3					
1844-45	133 1	0 9 L	10 9	+2 0					
1845-46	113 4	18 8 S	9 6	+3 3					
1846-47	146 7	14 5 L	13 8	-0 9					
1847-48	130 1	2 1 S	9 9	+3 0					Winter flood.
1848-49	139 2	7 0 L	14 1	-1 2					
1849-50	121 0	11 2 S	10 3	+2 6					
1850-51	113 4	18 8 S	10 6	+2 3			32 1	-2 8	
1851-52	136 1	3 9 S	14 2	-1 3	33 9	-0 10	32 10	-1 11	
1852-53	111 9	20 3 S	9 5	+3 4	35 3	+0 8	32 2	-2 7	
1853-54	130 1	2 1 S	15 0	-2 1	37 9	+3 2	32 0	-2 9	
1854-55	131 6	0 6 S	13 8	-0 9	31 9	-2 10	34 6	-0 3	
1855-56	130 1	2 1 S	12 0	+0 9	35 6	+4 11	36 9	+2 6	
1856-57	134 6	2 4 L	13 4	-0 5	34 10	+0 3	32 6	-2 3	
1857-58	122 5	9 7 S	12 8	+0 1	38 3	+3 8	36 6	+1 9	Almost a winter flood.
1858-59	121 0	11 2 S	13 1	-0 2	36 5	+1 10	36 5	+1 8	
1859-60	125 5	6 7 S	14 6	-1 7	35 11	+1 4	29 6	-5 3	
1860-61	127 1	5 1 S	11 6	+1 3	36 4	+1 9	41 7	+6 10	3rd highest spring flood.
1861-62	121 0	11 2 S	13 4	-0 5	36 6	+1 11	35 5	+0 8	
1862-63	146 7	14 5 L	12 1	+0 8	33 2	-1 5	36 9	+2 0	
1863-64	131 6	0 6 S	12 4	+0 5	37 6	+2 11	32 6	-2 3	
1864-65	118 1	14 1 S	13 8	-0 9	36 10	+2 3	40 9	+6 0	4th do
1865-66	128 6	3 6 S	12 1	+0 8	32 5	-2 2	33 2	-1 7	
1866-67	125 5	6 7 S	10 3	+2 6	37 8	+3 1	33 0	-1 9	
1867-68	124 0	8 2 S	14 7	-1 8	32 9	-1 10	32 10	-1 11	
1868-69	149 7	17 5 L	12 7	+0 2	31 10	-2 9	40 5	+5 8	6th do
1869-70	139 2	7 0 L	11 3	+1 6	36 6	+1 11	36 10	+2 1	
1870-71	111 9	20 3 S	10 7	+2 2	34 9	+0 2	32 0	-2 9	
1871-72	153 4	22 1 L	16 9	-4 0	31 5	-3 2	30 6	-4 3	
1872-73					27 5	-7 2	38 8	+3 11	7th do
1873-74					34 8	+0 1	31 9	-3 0	
1874-75	145 2	13 0 L	17 8	-4 9	30 0	-4 7	30 9	-4 0	
1875-76	151 3	19 1 L	14 0	-1 1	32 10	-1 9	34 2	-0 7	
1876-77	130 1	2 1 S	12 2	+0 7	34 11	+0 4	31 4	-3 5	
1877-78	102 9	29 3 S	7 2	+5 7	34 3	-0 3	29 8	-5 4	
1878-79	130 1	2 1 S	12 9	0 0	33 4	-1 3	34 3	0 6	
1879-80	140 7	8 5 L	11 1	+1 8	32 4	-2 3	33 7	-1 2	
1880-81	133 1	0 9 L	13 2	-0 3	31 5	-3 2	30 2	-4 7	
1881-82	136 1	3 9 L	8 9	+4 0	33 10	-0 9	31 3	-3 6	
1882-83	146 7	14 5 L	17 6	-4 7	30 2	-4 5	32 10	-1 11	
1883-84	134 6	2 1 L	13 7	-0 8	38 4½	+3 8½	37 5	+2 8	Almost a winter flood.
1884-85	149 7	17 5 L	19 7	-6 8	35 5	+0 8	40 8	+5 11	5th highest spring flood.
1885-86	133 0	0 8 L	14 1	-1 2	39 6	+4 11	44 4	+9 7	Winter flood and highest spring flood.
1886-87	143 7	11 5 L	17 0	-4 1	33 11	-0 8	43 1½	+8 4½	2nd highest spring flood.
		Variat'n 51.4 days.		Variat'n 12.5 degs					

MEMO. CURRENTS IN AIR-HOLES.

In an air-hole at Windmill Point on the 4th January, 1887, the ice at lower edge of hole was six inches thick, the surface current 1·3 miles per hour. Pieces of ice of all sizes from cubes of 3 inches to cakes 5 feet by 3 feet and 4 inches thick were promptly taken under the ice at lower edge. Fine frazil rested at lower edge of hole and backed up about six inches but from this point was drawn under. This air hole gradually closed during winter. It was in part over the end of the wharf and the current probably varied as the water raised or lowered.

In the long air-hole that existed the whole winter in the Boucherville Channel, the surface current was found in March to be 1·5 miles per hour. This air-hole filled up very slowly from the lower end during the winter by the thin ice formed on its surface being arrested at the lower end and filling upward; the part thus filled up presenting rough ice in thin cakes or shoved ice in miniature.

In the air-holes or open water between Morrisburg and Dickinson's Landing a variety of surface currents were observed. At a point opposite the lower end of Croil's Island the ice successively formed and was broken off by the wind. At this point the current seemed to be such that the ice would "take" in very cold weather without the influence of packing or jamming. The current was one mile per hour.

On 5th March, 1887, in an air-hole in current east of St. Helen's Island a box was put down with screen bottom to a depth of eight feet. It did not collect any frazil there nor at any depth below the surface, although there was a large quantity floating on the surface coming out from under the ice at the upper edge of the hole, and going under at the lower end. This frazil consisted of small portions of ice one-quarter of an inch square in area to three-quarters inch square and one-sixteenth inch to one-eighth inch thick, rounded on edges, as if ground and rubbed by passing a considerable distance under the ice.

MONTREAL FLOOD COMMISSION.

AREAS of Cross Sections of Water and Frazil in the River St. Lawrence in March, 1887. Water reduced to its height on the 15th March at the nearest gauge, referred to 19 feet on sill as 0.

Lachine Rapids to Victoria Bridge, Laprairie Gauge, 19 ft. 10½ in.			Longue Pointe to Pointe aux Trembles, Longue Pointe Gauge, 6 ft. 10½ in.		
Section.	Area of Water.	Area of Frazil.	Section.	Water.	Frazil.
	Sq. Ft.	Sq. Ft.		Sq. Ft.	Sq. Ft.
A, B, C.....	101,777	267,736	A, B.....	86,093	36,663
A, B, D, E.....	140,543	154,713	C, D.....	135,431	10,373
F, G, H.....	86,025	152,683	E, F.....	29,160	115
K, L.....	89,942	87,437	G, H.....	30,298	2,865
I, J.....	10,742	14,875	I, J.....	33,552	1,282
I, J to K, L.....	100,684	102,312	K, L.....	32,832	3,283
M, N, O.....	104,962	60,854	C, D and I, J.....	168,983	12,255
Victoria Bridge to Hochelaga, Harbour Office Gauge, 10 ft. 11 in.			Pointe aux Trembles to Varennes, Varennes Gauge, 3 ft. 3 in.		
Section.	Water.	Frazil.	Section.	Water.	Frazil.
	Sq. Ft.	Sq. Ft.		Sq. Ft.	Sq. Ft.
C, D.....	81,964	30,096	A, B & C, D, & D, E, & E, F	151,509	6,854
E, F.....	11,074	2,462	G, H.....	57,600	1,570
D, G.....	34,201	8,539	H, I.....	57,864	4,426
H, I.....	31,882	.....	J, K.....	93,781	4,293
J, K.....	28,268	.....	L, M.....	91,469	4,293
L, M.....	36,576	288	L, M and N, O.....	116,280	.....
N, O.....	5,602	1,483	Repentigny, Varennes Gauge, 3 ft. 3 in.		
O, P.....	46,858	4,565	Section.	Water.	Frazil.
P, O + O + J.....	80,728	6,048		Sq. Ft.	Sq. Ft.
Hochelaga to Longue Pointe, Hochelaga Gauge, 9 ft. 0 in.				181,771	3,124
Section.	Water.	Frazil.	Verchères, Sorel Gauge.		
	Sq. Ft.	Sq. Ft.	Section.	Water.	Frazil.
A, B.....	98,682	54,475		Sq. Ft.	Sq. Ft.
C, F.....	134,021	41,284		163,138	469
E, F.....	128,131	68,846	Lanoraie, Sorel Gauge.		
G, H.....	123,134	64,579	Section.	Water.	Frazil.
I, J.....	99,115	61,704		Sq. Ft.	Sq. Ft.
K, L.....	103,723	73,079		105,351	25,977
M, N.....	112,378	57,672	Sorel Section, Sorel Gauge.		
O, P.....	95,472	62,164	Section.	Water.	Frazil.
Q, R.....	97,200	65,362		Sq. Ft.	Sq. Ft.
S, T.....	110,246	54,000		217,722	345
U, V.....	104,702	43,589			
W, X.....	117,561	57,627			
Y, Z.....	105,566	72,677			
Y, A, B.....	139,190	44,383			

MONTREAL FLOOD COMMISSION.

QUANTITIES of Water and Frazil in the River St. Lawrence in March, 1887. Water reduced to its height on the 15th March at the nearest Gauge, referred to 19 ft. on sill of Old Lock No. 1, Lachine Canal, as datum.

Lachine Rapids to Victoria Bridge, Laprairie Gauge, 19 ft. 10½ in.		Longue Pointe to Pointe aux Trembles, Longue Pointe Gauge, 6 ft. 10 in.	
Cubic Yards, Water.	Cubic Yards, Frazil.	Cubic Yards, Water.	Cubic Yards, Frazil.
131,814,770	171,228,200	96,299,166	25,784,176
Victoria Bridge to Ile Ronde, Harbour Office Gauge, 10 ft. 11 in.		Pointe aux Trembles to Varennes, Varennes Gauge, 3 ft. 3 in.	
Cubic Yards, Water.	Cubic Yards, Frazil.	Cubic Yards, Water.	Cubic Yards, Frazil.
40,635,292	12,114,355	79,003,685	4,836,263
Ile Ronde to Longue Pointe, Hochelaga Gauge, 9 ft. 0 in.			
Cubic Yards, Water.	Cubic Yards, Frazil.		
91,539,659	45,443,417		

TEMPERATURE OF FLOOD YEARS.

The spring flood of 11th April, 1861, followed a winter in which the mean temperature was 1.3 degrees F. above the average, and the duration of mean temperature below freezing point 5.1 days shorter than the average.

The distribution of severe weather was about the normal; February being a little milder, comparatively speaking, than the rest of the winter, thus the flood of 1861 exceeded by only two on record, followed a winter free from peculiarities of temperature and milder and shorter than the average.

The next flood was on 3rd April, 1865. The winter temperature was 0.9 degrees F. below the average, and the duration of mean temperature below freezing point 14.1 days shorter than the average. In this winter the temperature was very nearly the average, and the distribution of severe frosts in the month almost like the typical average winter; the temperature descending regularly into January, and rising regularly from the lowest point, the descent and ascent, however, being more rapid than the average, thus rendering the period of severe frost shorter than the average.

The next flood (on 19th April, 1869), followed a winter peculiar, because of the unusual approach to equality of the mean temperatures of December, January, March and February. The mean winter temperature was almost the average, being only 0.2 degrees F. above it; and the duration of the temperature below freezing point was 17.5 days longer than the average. This a long and high temperature winter, is, therefore, a striking contrast to that of 1860-61, which was a short and severe one.

There was a low flood on 16th April, 1873, but the temperatures of the winter are wanting. The next flood on 27th April, 1885, followed a winter with the lowest mean temperature of forty-seven winters, it being 6.8 degrees F. below the average and the duration of freezing temperature was, with two exceptions, the longest of forty-seven winters, being 17.5 days longer than the average. The distribution of severe frost was about normal, except that the mean temperature of February was lower than that of January.

The next season, 1885-86, gave the first case on record of two floods, a winter flood on 11th January, and a spring flood on 18th April, the highest on record. And this season was almost a typical winter; the mean temperature being only 1.2 degrees Fah. below the average, and the duration of freezing weather being only 0.8 days longer than the average. The distribution of severe frost was also nearly typical, the temperature of February being a little lower in comparison with January than usual.

The next flood (on 22nd April, 1887), the second highest on record, was preceded by a winter very nearly typical in kind, but with a low mean temperature, viz., 4.15 degrees F. below the average and with a duration of freezing temperature, 11.5 days longer than the average.

Thus in reviewing the temperatures of forty-seven winters (1838-1887), the winter temperatures of 1872-73 and 1873-74 (being wanting) there does not appear any characteristic of temperature peculiar to flood years. Floods in April have followed almost every variety of winter found in forty-seven years. Winters short and severe, or winters long and mild; of mean temperature above the average and of the lowest mean temperature. On the other hand there have been very short and mild winters and very long and severe winters and also typical average winters not followed by floods.

MEMO. MONTREAL GAUGINGS.

The highest average of the gaugings of one month at the time of lowest water in the autumn at Montreal for twenty-eight years, which did not precede spring floods is 19 feet 5 inches on the lower sill of Old Lock No. 1, Lachine Canal, the lowest average is 15 feet 9 inches and the general average 17 feet 7 inches.

Of the seven autumns preceding spring floods, the highest average month at time of lowest water is 18 feet 7 inches (in 1860) and the lowest 16 feet 5 inches (in 1872),

the average being 17 feet 7 inches as before. The very high spring floods of 1861, 1886, 1887, were preceded by low water autumn months of 18 feet 7 inches, 17 feet 6 inches, and 18 feet, and as many springs without floods have been preceded by much higher water in autumn, there does not appear to be any coincidence of spring floods and high water in the preceding autumn.

Again taking the average of a month in mid-winter at lowest water in each of twenty-nine years without spring floods the highest is 32 feet 6 inches (in 1853) and the lowest 24 feet 4 inches (in 1875), the general average of the twenty-nine mid-winter months being 28 feet 5 inches. Of the seven spring flood years the highest average month of the low mid-winter months is 30 feet 6 inches (in 1861), the lowest 24 feet 10 inches (in 1873), the general average of the mid-winter months being for the seven years 28 feet 7 inches or nearly the same as the general average (28 feet 5 inches) of the non-flood years. Thus there does not appear to be a general coincidence of high water in mid-winter months and spring floods.

In the last thirty-six years there has been one decided winter flood, 11th January, 1886, and almost a winter flood (the water being on the revetment wall in some places) 3rd January, 1884. Of the remaining thirty-four years, in nine there has been very high water, approaching flood level in winter, and twenty-five in which the water reached about its average height at the time of the ice closing or "taking." The dates of the highest winter level (which is in general the date on which the river closes) has varied in the thirty-six years from 18th December (in 1871) to 31st January (in 1879) the average date being 4th January, or omitting 1871-72 and 1867-68, when the river closed on or before 20th December, and 1877-78, 1879-80, and 1881-82 when it did not close until 27th January or later, and which may be considered unusual years, the average date of highest water or river closing is 1st January. Of the eleven years in which there were winter floods or nearly winter floods, the dates of highest water vary from 2nd to 17th January, the average date being 10th January. It thus appears that the average date of closing in eleven years of very high water level has been six days later than the average of twenty-five years of ordinary water, and nine days later than the average of twenty years of ordinary water, the years before mentioned of very early or very late closing being omitted. On the whole, there appears to be a coincidence between moderately late closing and very high water, but there are striking exceptions as shown by the years 1877-78, 1878-79, 1881-82 when the river closed, respectively on the 29th, 31st and 27th January, with water about the average height.

The average date of the breaking up of the ice in non-flood years is 14th April, and in flood years four days later, on the 18th April, which is also the date of the highest flood.

MEMO.—ON OTTAWA GAUGINGS IN CONNECTION WITH HIGH WATER AT MONTREAL.

At the time of highest water in spring at Montreal for thirty-five years ending with 1887, the average height of water at the Rideau Canal, Ottawa, in the thirty-eight years in which there were not floods at Montreal, was twelve feet on the lower sill. In the seven flood years the average at Ottawa was sixteen feet nine and a-half inches on the sill at the time of the flood at Montreal, being in 1861, 1885, 1886, 1887, respectively, fourteen feet, nineteen feet nine inches, twenty-one feet and eighteen feet six inches on the sill at Ottawa, and in 1865, 1869 and 1873, respectively, fourteen feet six inches, thirteen feet three inches, and sixteen feet six inches.

The highest water at Ottawa in each of thirty-six years has occurred after the highest water at Montreal at intervals varying from nine days to fifty-nine days, the average of the twenty-nine non-flood years being thirty-three days, and of the seven flood years twenty-six days, the intervals in flood years being in 1861, 1885, 1886 and 1887 respectively, twenty-eight, twenty-two, nine, and twenty days; and in 1865, 1869 and 1873 respectively, thirty-five, thirty, and forty days. Thus spring has

brought down an increased discharge from the basin of the Ottawa, earlier in flood years than in non-flood years, relatively to the breaking up of the ice at Montreal, high water at Ottawa being caused not by ice jams, but by rains and the melting of snow. There is no doubt that a large discharge of water from the Ottawa has a tendency to produce floods in the St. Lawrence while the channel is being obstructed by ice, and it is not surprising to find that floods at Montreal and unusually high water at Ottawa have been coincident. This large discharge from the Ottawa however is probably a small part of the causes of a flood at Montreal, for very high water has occurred at Ottawa coincident with the high water of spring at Montreal without causing a flood, as in 1863, 1876 and 1883, though in 1863 there was very high water at Montreal. A tendency of the Ottawa to produce floods in the St. Lawrence apart from its absolute discharge at the time of ice shoves is its rapid increase of discharge. It is usually rising at the rate of more than six inches per day during the latter half of April. Lake Ontario too is usually at its most rapid rate of rise at this time, so that the discharge of the St. Lawrence is then rapidly increasing, and each shove which is the result of accumulated head, unless it breaks the main ice jam, is immediately followed by a demand for a greater water way; an increase of head follows, and the jams are either increased by pressure and addition of ice from above when contraction of the channel and increasing discharge still further raises the water, or the jams are broken and carried away to give relief and sufficient water way within the river's banks.

MEMO.—THE TAKING OF THE ICE IN LAKE ST. FRANCIS.

When Lake St. Francis has fully taken it does not break up again until spring, except in very rare cases, such as the unusually mild winter of 1878-79, when it broke up over the whole lake. But before the final closing up, which is about Christmas or New Year as a rule, large areas of ice in the lower portion of the lake break up in some years two or three times before the lake closes down to its winter regime. As an instance, the lake was closed across before the 12th December, 1886, and about that date at 12.30 noon, the ice began to run down at Coteau and continued running until about 9 p.m., piling up heavily on the islands and at the railway ferry slip on the Valleyfield side. The ice which ran down was about 8 inches thick. So long a run as this indicates a large area broken up, but, as residents at Lancaster and Summerstown state that it does not break up there, it is probable that the ice went from the wide lower half of the lake, probably below Port Lewis. The ice begins to freeze on the surface and run down with the first cold weather as in other places; but it appears that with a favourable wind and frost the ice takes across smooth a short distance above Coteau and then fills upward by packing, as in other parts of the channel.

NOTES.

15. *St. Helen's Island.*

Material chiefly volcanic trap.
Quantity above low water, 10,776,000 cubic yards.
Area, about 132 acres, English.

16. *Ile Ronde.*

Material chiefly volcanic trap.
Quantity above low water, 435,000 cubic yards.
Area, about 34½ acres, English.

17. *Moffatt's Island.*

Material chiefly trap.

Quantity measuring down to the level of the water below the wharf on river side of the island, when the water stands at 17 feet 9 inches on the sill of lock No. 1, Lachine Canal, 206,000 cubic yards.

18. *Old St. Lambert Wharf.*

Cribwork with stone filling.

Quantities down to natural bottom of river.

Between island and St. Lambert shore, 18,130 cubic yards.

West of Island, 43,240 cubic yards.

Total cribwork, 61,370 cubic yards.

Small Islands in St. Lambert Channel.

Material chiefly trap.

Quantity down to low water of about 18 feet on sill of lock No. 1, Lachine Canal, 30,520 cubic yards.

19. *Summary.*

Yards trap	11,447,520
Yards cribwork	61,370
Total	11,508,890 Cu. Yds.

20. *Areas of the River St. Lawrence.*

Prescott to Ile Ronde at Montreal:

Area closed in winter.....	185 sq. miles.
Area open in winter.....	45 do
Total.....	230 do

Average width, 2 miles.

Distance about 115 miles.

Ile Ronde at Montreal to Sorel:

Area closed in winter	61 sq. miles.
Area open in winter.....	3 do
Total.....	64 do

Average width $1\frac{1}{2}$ miles.

Distance about 45 miles.

Sorel to Ile au Raisin (head of Lake St. Peter proper):

Nearly all closed; a few small air-holes; area, 26 square miles.

Ile au Raisin to Nicolet, or Lake St. Peter proper, closed, 130 sq. miles.

Laprairie Bay, or Lachine Rapids to Victoria Bridge:

Area of water surface in summer, 29 sq. miles.

A bordage forms around this bay early in winter but does not increase rapidly, and about 19 sq. miles remained open in December, 1887, until the ice pack from below ascended to Victoria Bridge.

RIVER ST. LAWRENCE—MONTREAL TO SOREL.

WINTER and Summer Levels and Hydraulic Inclination.

Localities.	Elevation, 16th Sept., 1886.	Elevation, 27th Mar., 1887.	Rise or difference of Level, 16th Sept., '86 to 27th Mar., '87.	Total distance in Miles.	Interval distance in Miles.	Total Fall in Feet, 16th Sept., 1886.	Total Fall in Feet, 27th Mar., 1887.	Interval Fall in Feet, 16th Sept., 1886.	Interval Fall in Feet, 27th Mar., 1887.	Fall in Feet per Mile, 16th Sept., 1886.	Fall in Feet per Mile, 27th Mar., 1887.
Lock Sill, Montreal....	98·83	109·83	11·00	.....	.....	.....	.....	.....	.....	.....	.....
Longueuil.....	96·83	108·27	11·44	2·7	2·7	2·00	1·56	2·00	1·56	0·74	0·58
Longue Pointe.....	96·37	105·90	9·53	6·2	3·5	2·46	3·93	0·46	2·37	0·13	0·68
Pointe aux Trembles....	95·40	104·45	9·05	10·1	3·9	3·43	5·38	0·97	1·45	0·25	0·37
Varennas.....	94·75	103·18	8·43	13·7	3·6	4·08	6·65	0·65	1·27	0·18	0·35
Verchères.....	93·95	102·07	8·12	21·8	8·1	4·88	7·76	0·80	1·11	0·10	0·14
Contrecoeur.....	93·00	101·03	8·03	29·4	7·6	5·83	8·80	0·95	1·04	0·13	0·14
Lanoraie.....	92·83	99·95	7·12	36·0	6·6	6·00	9·88	0·17	1·08	0·03	0·16
Sorel.....	92·28	97·67	5·39	44·3	8·3	6·55	12·16	0·55	2·28	0·07	0·27

NOTE.—Elevation of Lower Sill of old (1848) Lock, No. 1, Lachine Canal, 81·00. Mean Elevation of Revetment Wall, 119·50.

HEIGHT of Floods, 1886 and 1887.

Above low water (approximate).

Places.	1886.	1887.
Laprairie Basin.....	19·5, April 18—20.....	17·0, April 22—24.
St. Helen's Island	27·0 do 20, 11·45 a.m..	23·0 do 22—24.
Longueuil (upper end)	24·0 do 20, 11·45 a.m..	25·5 do 24.
do (below village).....	21·5	22·5
Longue Pointe.....	20·5	19·0
Boucherville.....	20·0	18·75
Varennas.....	20·0	17·5
Verchères.....	20·0	18·0
Contrecoeur.....	20·0 .....	.....
Lanoraie.....	19·5 .....	.....
Sorel.....	16·0, April 20, 10 p.m....	15·5, April 20.

NOTE.—The flood of 1887 having gone away gradually, the time of the wave from Montreal was not definitely observed; but the flood of 1886 broke away suddenly at Montreal at 11·45 a.m., and the highest water occurred at Sorel at 10 p.m. the same day.

TABLE showing the Distribution of Frazil, Field-Ice and Water between Lachine Rapids and Varennes, in March, 1887.

Localities.	Distance in Feet.	Field-Ice.	Frazil	Water.	Total.	Per cent.		
						Field-Ice.	Frazil.	Water.
From Lachine Rapids 7,000 feet down, or $\frac{1}{2}$ distance to head of Nuns' Island	7,000	Cubic yds. 14,563,000	Cubic yds. 55,928,000	Cubic yds. 28,605,000	Cubic yds. 99,096,000	15	56	29
From last point to near head of Nuns' Island	7,000	12,752,000	46,054,000	37,641,000	96,447,000	13	47	40
From near head Nuns' Island to near foot of do	7,000	7,930,000	34,982,000	27,415,000	70,327,000	11	50	39
From near foot of Nuns' Island to Rifle Butts, Point St. Charles	7,000	6,546,000	21,151,000	24,920,000	52,615,000	12	41	47
From Rifle Butts, Point St. Charles, to Moffatt's Island and Wind Mill Point	7,000	6,831,000	12,108,000	25,331,000	44,270,000	15	28	57
From Moffatt's Island to head of Ile Ronde	7,000	5,625,000	6,795,000	23,996,000	36,416,000	15	19	66
From head of Ile Ronde to Hochelaga and Longueuil	7,000	4,762,000	7,882,000	24,696,000	37,340,000	13	21	66
From Hochelaga to near Handysides or the Poor House	7,000	5,741,000	13,065,000	28,500,000	47,306,000	12	28	60
From Handysides to the upper side of Longue Pointe	7,000	6,863,000	18,765,000	30,513,000	56,141,000	12	34	54
From the upper side of Longue Pointe to the lower side of Longue Pointe	7,000	6,224,000	11,707,000	29,248,000	47,239,000	13	25	62
From the lower side of Longue Pointe towards Pointe aux Trembles, 7,000 feet	7,000	4,282,000	8,778,000	32,160,000	45,220,000	9	20	71
From last point, still towards Pointe aux Trembles, 7,000 feet	7,000	4,282,000	6,913,000	36,571,000	47,766,000	9	15	76
From last point to a point just Pointe aux Trembles, or lower end Ile Gros Bois	7,000	4,340,000	4,491,000	41,257,000	50,088,000	9	9	82
From lower end Ile Gros Bois to head Ile Ste. Thérèse	7,000	4,535,000	2,477,000	41,545,000	48,557,000	9	5	86
From head Ile Ste. Thérèse to Varennes	7,000	3,940,000	1,445,000	34,814,000	40,199,000	10	3	87
Total	105,000 feet, or 19.9 miles.	99,216,000	252,601,000	467,212,000	819,029,000			

TABLE showing the levels of River St. Lawrence at No. 1 Lock of the Lachine Canal, and at the outfall of the Tail Race of the Montreal Aqueduct, 1872-73.

Date.	No. 1 Lock.	Tail Race.	Difference.	Temperature.	Grade, 1 inch.	Direction of the Wind.	Remarks.
1872.	Ft.	Ft.	Ft.	°			
Nov. 1	The levels of water refer to 19 feet deep on the lower mitre sill of (1848) Lock No. 1, Lachine Canal, as zero. This zero corresponds to 100'00 harbour datum.
do 2	.....	.....	.....	.....	.....	.....
do 3	.....	.....	.....	.....	.....	.....
do 4	.....	.....	.....	.....	.....	.....
do 5	.....	.....	.....	.....	.....	.....
do 6	.....	.....	.....	.....	.....	.....
do 7	.....	.....	.....	.....	.....	.....
do 8	-1 5	8 8	10 3	41	.....	N
do 9	-1 7	8 8	10 5	40	.....	W
do 10	-1 7	8 8	10 5	38	.....	W
do 11	-1 6	8 7	10 3	39	.....	N
do 12	-1 6	8 7	10 3	35	.....	N
do 13	-1 5	8 8	10 3	36	.....	W
do 14	-1 6	8 8	10 4	35	.....	W
do 15	-1 7	8 9	10 6	30	.....	W
do 16	-1 7	8 9	10 6	32	.....	W
do 17	-1 6	8 9	10 5	29	.....	NW
do 18	-1 6	8 8	10 4	31	.....	N
do 19	-1 6	8 7	10 3	26	.....	N
do 20	-1 7	8 7	10 4	26	.....	W
do 21	-1 7	8 8	10 5	28	.....	W
do 22	-2 1	8 7	10 8	33	.....	W
do 23	-2 2	8 7	10 9	31	.....	N
do 24	-2 3	8 7	11 0	37	.....	N
do 25	-2 4	8 7	11 1	42	.....	W
do 26	-2 4	8 7	11 1	31	.....	W
do 27	-2 4	8 7	11 1	29	.....	NW
do 28	-2 5	8 7	11 2	24	.....	N
do 29	-2 6	8 7	11 3	23	.....	S
do 30	-2 6	8 8	11 4	14	.....	S
Dec. 1	-2 7	8 8	11 5	19	.....	N
do 2	-2 7	8 8	11 5	29	.....	N
do 3	-2 6	8 8	9 4	33	.....	NW
do 4	-2 6	8 8	11 4	21	.....	W
do 5	-2 7	8 8	11 5	22	.....	W
do 6	-2 7	8 8	11 5	21	.....	N
do 7	-2 7	8 8	11 5	18	.....	N
do 8	-2 7	8 8	11 5	30	.....	W
do 9	-2 7	8 8	11 5	19	.....	W
do 10	-2 7	9 7	12 4	- 7	.....	W
do 11	-2 7	10 0	12 0	- 4	.....	NW
do 12	-2 7	9 7	12 4	- 5	.....	S
do 13	-2 6	9 5	12 1	+15	.....	S
do 14	-2 2	9 4	12 6	24	.....	N
do 15	-2 2	9 6	11 8	23	.....	N
do 16	-1 5	9 7	11 2	31	.....	W
do 17	-1 1	9 9	10 0	20	.....	W
do 18	-0 5	10 0	10 5	22	.....	S
do 19	+0 3	10 3	10 0	18	.....	W
do 20	+0 5	10 0	9 5	19	.....	NW
do 21	+0 8	10 1	9 3	18	.....	W
do 22	+1 5	10 1	8 6	- 7	.....	N
do 23	+3 12	10 0	6 8	- 7	.....	W
do 24	+5 5	10 0	4 5	- 9	.....	NW
do 25	+8 3	11 9	3 6	- 9	.....	W
do 26	+8 2	12 7	4 5	- 8	.....	E
do 27	+8 2	10 2	2 0	- 3	.....	NW
do 28	+7 1	9 9	2 8	- 6	.....	N
do 29	+7 3	9 7	2 4	- 5	.....	N
do 30	+7 3	9 7	1 4	- 5	.....	NW
do 31	+6 9	9 7	2 8	- 4	.....	N

TABLE showing the Levels of River St. Lawrence, &c.—Continued.

Date.	No. 1 Lock.	Tail Race.	Difference.	Temperature.	Grade, 1 inch.	Direction of the Wind.	Remarks.
1873.	Ft.	Ft.	Ft.	°			
Jan. 1.....	+6.8	12.6	5.8	+2	.....	N	
do 2.....	+6.3	12.2	5.9	13	.....	N	
do 3.....	+7.0	13.7	6.7	32	.....	S	
do 4.....	+8.2	13.0	5.0	32	.....	SW	
do 5.....	+8.3	13.9	4.6	37	.....	N	
do 6.....	+8.4	12.4	4.0	18	.....	NW	
do 7.....	+7.3	12.2	4.9	-1	.....	N	
do 8.....	+6.5	12.9	5.4	+8	.....	E	
do 9.....	+7.1	12.2	5.1	23	.....	W	
do 10.....	+7.0	12.2	5.2	9	.....	W	
do 11.....	+6.8	11.9	5.1	5	.....	NW	
do 12.....	+6.8	12.1	5.3	5	.....	W	
do 13.....	+6.9	12.2	5.3	3	.....	E	
do 14.....	+6.9	12.3	5.4	17	.....	NE	
do 15.....	+7.0	12.9	5.9	4	.....	N	
do 16.....	+6.7	12.0	5.3	21	.....	W	
do 17.....	+8.2	12.9	4.7	19	.....	W	
do 18.....	+7.9	13.0	4.1	9	.....	E	
do 19.....	+7.5	13.0	5.5	13	.....	W	
do 20.....	+7.0	13.0	6.0	16	.....	S	
do 21.....	+7.2	13.2	6.0	21	.....	SW	
do 22.....	+7.2	13.7	6.5	17	.....	E	
do 23.....	+6.8	13.0	6.2	5	.....	E	
do 24.....	+6.4	13.0	6.6	3	.....	W	
do 25.....	+6.3	13.0	6.7	15	.....	W	
do 26.....	+5.7	13.2	7.5	16	.....	SW	
do 27.....	+6.3	13.3	7.0	16	.....	N	
do 28.....	+6.3	13.3	7.0	14	.....	NW	
do 29.....	+6.2	12.8	6.6	-7	.....	W	
do 30.....	+5.7	12.9	7.2	+2	.....	E	
do 31.....	+6.3	13.6	7.3	21	.....	W	
Feb. 1.....	+5.9	13.5	7.6	1	.....	W	
do 2.....	+5.9	13.4	7.5	2	.....	W	
do 3.....	+5.3	13.3	8.0	14	.....	W	
do 4.....	+5.7	13.2	7.5	31	.....	S	
do 5.....	+6.2	13.5	7.3	18	.....	S	
do 6.....	+6.2	13.4	7.2	10	.....	W	
do 7.....	+6.4	13.5	7.1	10	.....	E	
do 8.....	+6.7	13.3	6.6	25	.....	SW	
do 9.....	+6.3	13.2	6.9	6	.....	W	
do 10.....	+6.3	13.0	6.7	2	.....	W	
do 11.....	+5.2	13.1	7.9	3	.....	W	
do 12.....	+5.3	13.0	7.7	5	.....	E	
do 13.....	+5.1	13.1	8.0	7	.....	NE	
do 14.....	+5.1	13.6	8.5	3	.....	E	
do 15.....	+4.9	13.8	8.9	14	.....	S	
do 16.....	+5.1	14.0	9.9	14	.....	E	
do 17.....	+5.5	14.0	8.5	25	.....	N	
do 18.....	+5.9	14.3	8.4	23	.....	N	
do 19.....	+6.3	14.2	7.9	36	.....	W	
do 20.....	+5.9	13.8	7.9	17	.....	N	
do 21.....	+5.5	13.7	8.2	13	.....	W	
do 22.....	+5.3	13.7	8.4	13	.....	NW	
do 23.....	+5.3	13.6	8.3	8	.....	NW	
do 24.....	+5.3	13.3	8.0	10	.....	N	
do 25.....	+5.7	13.2	7.5	25	.....	N	
do 26.....	+6.1	13.5	7.4	31	.....	N	
do 27.....	+6.3	13.8	7.5	24	.....	N	
do 28.....	+6.5	14.0	7.5	33	.....	N	
March 1.....	+6.5	15.0	8.5	33	.....	N	
do 2.....	+6.8	15.0	8.2	31	.....	W	
do 3.....	+6.8	14.9	8.1	17	.....	N	
do 4.....	+5.9	14.8	8.9	11	.....	NW	

TABLE showing the levels of the River St. Lawrence, &c.—*Concluded.*

Date.	No. 1 Lock.	Tail Race.	Difference.	Temperature.	Grade, 1 inch.	Direction of the Wind.	Remarks.
1873.	Ft.	Ft.	Ft.	°			
March 5.....	+5.7	14.5	8.8	14	.....	W	
do 6.....	+5.7	14.4	8.7	21	.....	NW	
do 7.....	+5.9	14.4	8.5	34	.....	S	
do 8.....	+5.5	14.7	9.2	37	.....	S	
do 9.....	+6.2	14.7	8.5	30	.....	W	
do 10.....	+5.9	14.4	8.5	30	.....	S	
do 11.....	+6.0	14.3	8.3	29	.....	W	
do 12.....	+6.1	14.2	8.1	31	.....	N	
do 13.....	+6.3	14.2	7.9	32	.....	N	
do 14.....	+6.3	14.4	8.1	36	.....	NW	
do 15.....	+6.3	14.5	8.2	34	.....	W	
do 16.....	+6.3	14.6	8.3	31	.....	W	
do 17.....	+6.2	14.6	8.4	30	.....	N	
do 18.....	+6.2	14.6	8.4	30	.....	N	
do 19.....	+6.3	14.8	8.5	33	.....	E	
do 20.....	+6.5	14.7	8.2	36	.....	E	
do 21.....	+6.5	14.7	8.2	31	.....	N	
do 22.....	+6.6	14.8	8.2	25	.....	W	
do 23.....	+6.4	14.6	8.2	17	.....	NW	
do 24.....	+6.2	14.8	8.6	25	.....	W	
do 25.....	+6.2	14.7	8.5	20	.....	N	
do 26.....	+6.1	14.6	8.5	18	.....	N	
do 27.....	+6.1	14.7	8.6	23	.....	W	
do 28.....	+6.2	14.8	8.6	36	.....	S	
do 29.....	+6.9	15.2	8.3	36	.....	E	
do 30.....	+6.9	15.4	8.5	34	.....	NE	
do 31.....	+7.2	15.6	8.4	34	.....	E	
April 1.....	+7.7	15.6	7.8	46	.....	W	
do 2.....	+8.0	15.6	7.6	41	.....	S	
do 3.....	+8.0	15.5	7.5	37	.....	N	
do 4.....	+9.0	15.5	6.5	36	.....	NW	
do 5.....	+9.5	15.8	6.3	37	.....	W	
do 6.....	+9.8	16.0	6.2	35	.....	NW	
do 7.....	+9.8	16.0	6.2	35	.....	S	
do 8.....	+10.0	16.1	6.1	39	.....	S	
do 9.....	+10.2	16.2	6.0	34	.....	W	
do 10.....	+10.2	16.6	6.4	42	.....	S	
do 11.....	+11.9	16.9	7.0	41	.....	W	
do 12.....	+13.8	17.4	4.4	38	.....	W	
do 13.....	+14.3	18.2	3.9	35	.....	N	
do 14.....	+14.6	21.6	5.0	39	.....	NW	
do 15.....	+14.7	21.1	6.4	41	.....	W	
do 16.....	+14.7	20.8	6.1	55	.....	W	
do 17.....	+19.5	22.1	2.6	39	.....	N	
do 18.....	+19.3	22.4	3.1	41	.....	NE	
do 19.....	+16.3	17.9	1.6	45	.....	N	
do 20.....	+14.9	17.2	2.3	42	.....	NW	
do 21.....	+13.8	16.3	2.5	34	.....	N	
do 22.....	+12.9	14.6	1.7	40	.....	NW	
do 23.....	+11.5	14.0	2.5	42	.....	NW	
do 24.....	+8.5	.....	.....	.....	.....	.....
do 25.....	+7.8	.....	.....	.....	.....	.....

HARBOUR COMMISSIONERS OF MONTREAL.

MEMORANDUM of Quantities of Dredgings deposited in the River St. Lawrence between Montreal and Longue Pointe, from 1877 to 1886.

Year.	Quantity Dredged.	Quantity used for back filling unloaded by Derricks.	Balance deposited in River from Hopper Scows.	Remarks.
	Cub. Yds.	Cub. Yds.	Cub. Yds.	
1877	173,449	82,844	90,605	
1878	211,731	97,110	114,621	
1879	189,609	65,969	123,640	
1880	186,430	111,217	75,213	
1881	170,764	91,800	78,964	
1882	196,768	106,875	89,893	
1883	186,939	66,015	120,924	
1884	147,845	78,615	69,230	
1885	102,197	52,152	50,045	
1886	57,728	53,257	4,471	Dumping was only continued a few weeks in spring.
Totals	1,623,460	805,854	817,606	

The above quantities are "scow measurement;" the actual quantities in the solid would be about one-third less.

REPORT ON ICE BLASTING BY W. L. SCOTT, C.E.

T. C. KEEFER, Esq., C.E.,
Chairman, Montreal Flood Commission,
Montreal.

SIR,—For the information of the Flood Commission I beg to report on the ice blasting between Ile Ste. Thérèse and Montreal, as follows:—

On 9th March, 1887, experiments were made at Pointe aux Trembles by the members of the Flood Commission with various explosives furnished by Hamilton Powder Company, with a view of ascertaining the comparative efficiency of nitro-glycerine and powder in blasting ice. Several qualities of powder were experimented with and one preparation of nitro-glycerine-dualine. The following is a description of the trials:—

No. 1. Ice at this point was four feet three inches thick, and a depth of eight feet of frazil found under the ice. One 25, lb. keg of "No. 1 powder" was sunk down to the bottom of the frazil and exploded. Very little effect of any kind was produced. A person standing two hundred feet away from the hole did not know it had exploded.

No. 2. A hole was made two feet deep in the ice and a-quarter pound charge of dualine placed in it and fired. A large hole was thus made in the ice, and in this hole was lowered a 2-lb. charge of dualine, eight feet below the surface of the water. Shock from this charge was slight and raised a small field of ice about the hole some six inches, but very little water and no ice was thrown up. The snow and ice immediately about the hole were cracked and somewhat disturbed but not much displaced, some four or five small cracks were made in the surface of the snow running in irregular radial directions to the north of the hole.

After this a 25-lb. keg of No. 3 blasting powder was sunk in this hole, to a depth of ten feet, and fired. This produced scarcely any perceptible noise and very little shock on the ice at two hundred feet distant. No water nor ice were thrown up. The field-ice about the hole seemed to lift up about three inches and then fall back. No more cracks were opened and the indications generally were that this charge was less effective than the 2 lbs. of dualine. On digging down over one of the radial cracks made by the former charge, at a distance of six feet from the hole a good crack was found in the ice, about one-half inch wide.

No. 3. Ice two feet nine inches thick and nine feet of frazil found under the ice. One keg of 25 lbs. "sporting powder F. F." was sunk under the frazil and exploded.

This gave a sharp, strong explosion, throwing up water and small pieces of ice in a cloud, some falling one hundred and fifty feet from the hole. The ice in the vicinity of the hole was shattered and sunk in a crater-like form around the hole, in a circle of thirty-five feet diameter.

No. 4. Ice three feet thick and eight feet of frazil under the ice, two 25-lb. kegs of No. 2 powder were sunk in this hole and floated down stream under the frazil by the current. The shock was not great, and a large portion of unburned powder was thrown up with ice and water. A sunken crater about twenty feet in diameter was found about the new hole (the explosion having formed an entirely new hole up through the frazil and ice below the old one), which seemed to indicate that the frazil below it had been dislodged below it by the explosion.

No. 5. Ice three feet two inches thick and seven and a-half feet frazil under the ice.

A 5-lb. charge of dualine (in cartridges) was sunk in this hole under the frazil and exploded. Explosion took place with a hard, sharp crack, entirely unlike the thud produced by powder (the sporting powder, however, produced an effect nearest to this). Not much water or ice thrown up, but a hard vibration, resembling a blow on the sole of the foot, was distinctly felt at a distance of two hundred feet from the hole. Ice and snow cracked to a distance of from twenty to thirty feet from the

hole, it being difficult, however, to trace the end of the cracks on account of the water on the ice.

No. 6. Ice two feet six inches thick and nine feet of frazil under the ice. A charge of 10 lbs. of dualine (in cartridges) was sunk in this hole and allowed to float under the frazil. A very sharp vibration was produced by the explosion, much sharper than No. 5, but not stronger. A large mound of ice and snow, 12 feet diameter, was blown through the frazil and ice; large pieces of ice were broken off and thrown up all round the hole; no cracks visible near the hole, and this was considered evidently too strong a charge.

No. 7. Ice three feet thick and ten feet frazil under the ice 20 lbs. sporting powder was sunk to a depth of eighteen feet by ballast and exploded. Report duller than last charge of dualine, but more vibration, it being felt distinctly at one hundred feet distant, and just following the report a cracking of the ice near the hole. A large mound of frazil and ice thrown up about the hole, and, at the time of explosion, water and ice being thrown ten feet high. Cracks were found extending fifteen feet radially from the hole, with occasional annular cracks near the hole.

No. 8. Ice three feet thick and six feet frazil under the ice. A charge of 20 lbs. sporting powder was sunk by ballast to a depth of twenty-eight feet and exploded. Report slightly sharper than produced by the same charge sunk to a depth of eighteen feet, but still more of a thud than produced by the dualine. A hole seven feet in diameter was the result of this explosion, and pieces of ice from 50 to 100 lbs. weight were thrown up about the hole. No water was thrown up at the time of the explosion, but immediately after a rush or wave of water was spouted through the hole, and flying to a distance of twenty-five feet over the snow. This charge produced more vibration than any previous one, as two or more distinct vibrations were perceptible in the vicinity of the hole, and were distinctly felt at a distance of one hundred feet from the hole.

No. 9. Ice two feet nine inches thick, and nine feet of frazil under the ice. A charge of 25 lbs. of No. 2 blasting powder was sunk to a depth of thirty feet; the effect was little more than perceptible, and no hole blown through the ice. Very slight appearance of commotion on the surface and vibration very indistinct. No appearance of cracks in the snow or ice.

No. 10. Ice three feet thick and eight feet frazil under the ice. Five lbs. dualine was sunk by ballast to a depth of thirty feet under the ice. A sharp report followed the explosion, succeeded by two distinct vibrations distinctly felt at a hundred feet distant. No new hole was blown through the ice, but cracks were made extending fifteen feet from the old hole.

No. 11. Ice three feet thick and nine feet of frazil under the ice. Charge of five lbs. dualine sunk by ballast twenty feet deep. A sharp report followed and strong vibrations. A new hole was blown through the ice and frazil five feet in diameter, and water and frazil thrown out but not blown into the air with great force.

No. 12. Surface blast. A three lb. charge of dualine was exploded in a little cavity on top of the ice; the effect of the explosion was a hole completely through the ice three feet in diameter, but not otherwise damaging the ice; report sharp and clear, but no vibration produced.

These experiments showed the decidedly superior qualities of dualine and sporting powder as compared with other powders for breaking the ice, the object being not so much the comparatively slow formation of a large quantity of gas, as the quick sudden blow on the lower surface of the ice got from the dualine and sporting powder. Dualine was therefore on account of cost, selected as the explosive to be used, and in charges of about 5 lbs. In a general way the work of ice blasting under consideration consisted of the breaking of the ice along two parallel lines running in the deep water channel from a point opposite the head of Isle Ste. Thérèse, about one and a-half miles below the village of Pointe aux Trembles, to a point about opposite the Town of Longueuil.

These longitudinal lines were from 800 to 1,000 feet apart, and were connected every half mile by a cross-line making an angle of 45 degrees with the longitudinal lines, and running from south to north and from north to south alternately.

The accompanying plan shows the position of the longitudinal and cross-lines, average depth of frazil at different places and the position of each point at which the ice was blasted (marked by small red cross).

There is also attached a table giving depth of frazil, thickness of ice and weight of charge of dualine used at each hole blasted, also the date of blasting the different localities.

Work was regularly commenced on 14th March and continued without interruption till 14th April. The extent of the ground covered was about eight and a half miles and the total length of line blasted about twenty-one and a half miles.

The total number of holes blasted was about eight hundred, and the total quantity of dualine used about 4,600 lbs.

The force employed on the work consisted of one engineer, one chainman, one magazine-man, two blasters, one foreman and a gang of choppers, labourers and carters, varying from twenty to fifty.

Cost: The total cost of the work was \$2,457.67, being about \$3.06 per hole blasted, but the lower part of the work was much cheaper than the upper part, where higher wages had to be paid and there the cost of cutting the holes was much greater. About one-half of this cost per hole was paid for wages and superintendence, and the balance for explosive and general expenses.

The explosive used throughout was dualine, and generally in lower part of work in five pound charges, and the distances apart of the holes in the lower part about one hundred and fifty feet. Heavier charges, six pounds, were, however, used where the frazil and shoved ice were stronger, about and above Longue Pointe, and in this part of the work the holes were cut about one hundred feet apart.

Owing to the depth of snow and water on top of the ice, it was difficult at any moderate cost of time or money to ascertain exactly the effect of the blasting on the ice as the work progressed. Observations conclusively showed, however, that the damage done by the explosions consisted more in the crushing effect of the sudden blow than in cracking the ice by forming a wave in the water, and the point aimed at in the blasting was to produce as great a shock as possible without any great blowing out of water and ice from the hole.

Where practicable the charge was always lowered down through the ice and frazil and allowed to float down by the current under frazil. Pieces of solid ice, three feet thick, thrown up by the explosions, were found completely crushed to within six inches of the top surface, and this crushed portion, although remaining in the piece, was so soft it could be scraped off by the hand.

Vibrations could be distinctly felt on the ice at one mile distant from where the explosions took place, and felt very much like a tap on the sole of the boot.

Better results in this crushing were obtained where there was no frazil under the ice than where there was much frazil and shoved ice below the surface ice.

Experiments were made with charges placed on the bottom of the river instead of just below the frazil. No apparent advantage was gained by this arrangement; on the contrary these blasts, with the same weight of charge as usual, were less effective than those nearer the ice.

The great depth of the water, however, may have something to do with the result.

I am glad that the whole work was performed without any accident and with only such delays as resulted from days of bad weather.

Respectfully submitted.

W. L. SCOTT.

SOREL, P.Q.

MONTREAL FLOOD COMMISSION.

Cost of blasting operations between Pointe aux Trembles and Montreal, in the spring of 1887.

Men's wages	\$907 61
Salaries and expenses of engineers in charge	267 41
Explosives, dualine, 4,600 lbs.....	963 50
do Fuse and wire.....	65 00
Boxes for dualine charges.....	19 25
Magazine thawing apparatus and fuel for warming dualine.....	33 90
Cord and weights for ballast.....	40 82
Ice chisels, axes and shovels.....	92 98
Miscellaneous stores, &c.....	62 20
Total.....	<u>\$2,452 67</u>

MONTREAL FLOOD COMMISSION.

TABLE showing thickness of Ice and Frazil in the holes made for ice-blasting between Pointe aux Trembles and Hochelaga, March and April, 1887.

SECTION 1.

Position of Holes. — Station.	Date.	NORTH SIDE.			Remarks.	Position of Holes. — Station.	Date.	SOUTH SIDE.			Remarks.
		Ice.	Frazil	Charge				Ice.	Frazil	Charge	
496	Mar. 18.	3 6	None	5 lbs.	0. M.	496	Mar. 18.	2 3	None	5 lbs.	0. M.
497	do 18.	3 0	do	do		497	do 18.	2 6	do	do	
498	do 18.	3 3	do	do		498	do 18.	3 3	do	do	
499	do 16.	2 9	do	do		499	do 18.	3 3	do	do	
500	do 16.	3 0	do	do		500	do 21.	3 0	do	do	
501	do 16.	4 0	do	do		501	do 21.	3 0	do	do	
502	do 16.	3 0	do	do		502	do 21.	3 0	do	do	
503	do 16.	3 0	do	do		503	do 21.	2 6	do	do	
504	do 16.	2 6	do	do		504	do 21.	3 0	do	do	
505	do 16.	4 0	do	do		505	do 21.	2 6	do	do	
506	do 16.	3 0	do	do		506	do 21.	2 0	do	do	
507	do 16.	3 0	do	do		507	do 21.	2 0	do	do	
508	do 16.	3 0	do	do		508	do 21.	2 6	do	do	
509	do 16.	2 6	do	do		509	do 21.	2 6	do	do	
510	do 16.	2 6	do	do	$\frac{1}{2}$ mile.	510	do 21.	2 6	do	do	$\frac{1}{2}$ mile.
511	do 17.	3 0	do	do		511	do 21.	2 6	do	do	
512	do 17.	3 0	do	do		512	do 21.	2 6	do	do	
513	do 17.	2 0	do	do		513	do 21.	2 6	do	do	
514	do 17.	2 6	do	do		514	do 21.	2 0	do	do	
515	do 17.	3 0	do	do		515	do 21.	2 0	do	do	
516	do 17.	2 6	do	do		516	do 21.	2 6	do	do	
517	do 17.	2 6	do	do		517	do 21.	2 0	do	do	
518	do 17.	2 6	do	do		518	do 21.	3 0	do	do	
519	do 17.	2 6	do	do		519	do 21.	2 6	do	do	
520	do 17.	2 6	do	do		520	do 21.	2 6	do	do	
521	do 17.	3 0	do	do		521	do 21.	2 6	do	do	
522	do 17.	3 0	do	do		522	do 21.	2 0	do	do	
523	do 19.	3 0	3 0	do		523	do 21.	2 0	do	do	
524	do 19.	3 0	3 0	do	1 mile.	524	do 21.	2 0	do	do	1 mile.
525	do 19.	2 9	3 0	do		525	do 21.	2 6	do	do	
526	do 19.	3 0	2 0	do		526	do 21.	3 0	do	do	
527	do 19.	3 0	2 0	do		527	do 21.	2 6	do	do	
528	do 19.	3 0	None	do		528	do 21.	2 6	3 0	do	
529	do 19.	3 0	do	do		529	do 21.	2 0	None	do	
530	do 19.	2 6	1 0	do		530	do 21.	2 6	do	do	
531	do 19.	3 0	None	do		531	do 21.	2 6	do	do	

SECTION 2.

532	do 19.	3 0	do	do	532	do 18.	2 6	do	do
533	do 19.	3 0	2 0	do	533	do 18.	None	do	do
534	do 19.	3 0	None	do	534	do 18.	3 0	do	do
535	do 19.	2 6	do	do	535	do 18.	2 6	do	do
536	do 19.	2 0	do	do	536	do 18.	3 0	do	do
537	do 19.	2 6	do	do	537	do 18.	3 0	do	do
538	do 19.	3 0	do	do	538	do 18.	4 0	do	do
539	do 19.	4 0	do	do	539	do 18.	3 0	do	do
540	do 19.	3 0	do	do	540	do 18.	3 0	do	do
541	do 19.	2 6	do	do	541	do 18.	3 0	do	do
542	do 15.	3 6	do	do	542	do 19.	2 0	4 0	do
543	do 15.	3 0	do	do	543	do 19.	4 0	8 0	do
544	do 15.	3 6	do	do	544	do 19.	3 0	12 0	do
545	do 15.	3 3	do	do	545	do 19.	3 0	6 0	do
546	do 15.	3 3	do	do	546	do 19.	3 0	8 0	do

TABLE showing.—Ice, Frazil, &c.—Continued.

SECTION 2 Continued.

WATER NO.	Date.	NORTH SIDE.			Remarks.	Station.	Date.	SOUTH SIDE.			Remarks.
		Ice	Frazil	Charge				Ice	Frazil	Charge	
547	Mar. 21	Not obs'd.			5 lbs. 1½ miles.	547	Mar. 19	2 6	12 0		5 lbs. 1½ miles.
548	do 21	Not obs'd.			do	548	do 19	3 0	12 0		do
549	do 21	Not obs'd.			do	549	do 19	3 0	12 0		do
550	do 21	Not obs'd.			do	550	do 19	2 6			do
551	do 21	Not obs'd.			do	551	do 19	2 6			do
552	do 21	Not obs'd.			do	552	do 19	2 6	10 0		do
553	do 21	Not obs'd.			do	553	do 19	2 6	12 0		do
554	do 21	Not obs'd.			do	554	do 19	2 6			do
555	do 21	Not obs'd.			do	555	do 19	2 6			do
556	do 21	Not obs'd.			do	556	do 19	2 6			do
557	do 21	Not obs'd.			do	557	do 19	2 6	12 0		do
558	do 21	Not obs'd.			do	558	do 19	2 6	8 6		do
559	do 21	Not obs'd.			do	559	do 19	2 6	6 0		do
560	do 21	Not obs'd.			do	560	do 19	2 6	18 9		do
561	do 21	Not obs'd.			do	561	do 19	2 6			do
562	do 21	Not obs'd.			do	562	do 19	2 6	5 0		do
563	do 21	Not obs'd.			do 2 miles.	563	do 19	2 0			do 2 miles.

SECTION 3.

564	do 19	2 6	3 0	do	564	do 19	2 6	3 0	do
565	do 19	2 6		do	565	do 19	2 6		do
566	do 19	2 6		do	566	do 19	2 6		do
567	do 24	2 6	4 0	do	567	do 24	2 6	4 0	do
568	do 24	2 6		do	568	do 24	2 6		do
569	do 23	2 6	5 0	do	569	do 23	2 6	5 0	do
570	do 23	2 6	6 0	do	570	do 23	2 6	6 0	do
571	do 23	2 6	5 0	do	571	do 23	2 6	5 0	do
572	do 23	2 6		do	572	do 23	2 6		do
573	do 23	2 6		do	573	do 23	2 6		do
574	do 23	2 6		do	574	do 23	2 6		do
575	do 23	2 6		do	575	do 23	2 6		do
576	do 23	2 6	5 0	do	576	do 23	2 6	5 0	do
577	do 23	2 6	6 0	do	577	do 23	2 6	6 0	do
578	do 23	2 6		do	578	do 23	2 6		do
579	do 23	2 6	4 0	do 2½ miles.	579	do 23	2 6	4 0	do 2½ miles.
580	do 23	2 6	7 0	do	580	do 23	2 6	7 0	do
581	do 23	2 6		do	581	do 23	2 6		do
582	do 23	2 6		do	582	do 23	2 6		do
583	do 23	2 6	4 0	do	583	do 23	2 6	4 0	do
584	do 23	2 6		do	584	do 23	2 6		do
585	do 23	2 6		do	585	do 23	2 6		do
586	do 23	2 6	6 0	do	586	do 23	2 6	6 0	do
587	do 23	2 6	9 0	do	587	do 23	2 6	9 0	do
588	do 23	2 6	8 0	do	588	do 23	2 6	8 0	do
589	do 23	2 6	9 0	do	589	do 23	2 6	9 0	do
590	do 23	2 6	9 0	do	590	do 23	2 6	9 0	do
591	do 23	2 6	6 0	do	591	do 23	2 6	6 0	do
592	do 23	2 6	6 0	do	592	do 23	2 6	6 0	do
593	do 23	2 6	6 0	do	593	do 23	2 6	6 0	do
594	do 23	2 6	6 0	do	594	do 23	2 6	6 0	do
595	do 23	2 6	6 0	do 3 miles.	595	do 23	2 6	6 0	do 3 miles.

TABLE showing Ice, Frazil, &c.—Continued.

SECTION No. 4.

Station.	Date.	NORTH SIDE.			Remarks.	Station.	Date.	SOUTH SIDE.			Remarks.
		Ice.	Frazil	Charge				Ice.	Frazil	Charge	
596	Mar. 24..	2 6	6 0	5 lbs.		596	Mar. 23..	2 0	4 0	5 lbs.	
597	do 24..	2 6	6 0	do		597	do 23..	2 0	3 0	do	
598	do 24..	2 6	6 0	do		598	do 23..	2 0	.....	do	
599	do 24..	2 6	6 0	do		599	do 23..	2 0	.....	do	
600	do 24..	2 6	5 0	do		600	do 23..	2 6	5 0	do	
601	do 24..	2 6	8 0	do		601	do 23..	2 0	4 0	do	
602	do 24..	3 0	8 0	do		602	do 23..	2 6	4 0	do	
603	do 24..	4 0	6 0	do		603	do 23..	2 6	5 0	do	
604	do 24..	2 6	5 0	do		604	do 23..	2 6	4 0	do	
605	do 24..	3 0	7 0	do		605	do 23..	2 6	3 0	do	
606	do 24..	3 0	8 0	do		606	do 23..	2 6	4 0	do	
607	do 24..	3 0	6 0	do		607	do 23..	2 6	5 0	do	
608	do 24..	2 6	6 0	do		608	do 23..	2 6	6 0	do	
609	do 24..	3 0	.....	do		609	do 23..	2 6	5 0	do	
610	do 24..	3 0	6 0	do	3½ miles.	610	do 23..	2 6	6 0	do	3½ miles.
611	do 24..	3 0	5 0	do		611	do 23..	2 6	6 0	do	
612	do 23..	2 6	6 0	do		612	do 23..	2 6	5 0	do	
613	do 23..	2 6	6 0	do		613	do 23..	2 6	.....	do	
614	do 26..	2 6	10 0	do		614	do 26..	2 6	10 0	do	
615	do 26..	2 6	10 0	do		615	do 26..	2 6	10 0	do	
616	do 26..	3 0	9 0	do		616	do 26..	2 6	10 0	do	
617	do 26..	2 0	10 0	do		617	do 26..	2 6	10 0	do	
618	do 26..	2 0	10 0	do		618	do 26..	2 6	2 6	do	
619	do 26..	2 0	8 0	do		619	do 26..	2 6	5 6	do	
620	do 26..	2 0	10 0	do		620	do 26..	2 6	10 0	do	
621	do 26..	2 0	10 0	do		621	do 26..	2 6	10 0	do	
622	do 26..	2 6	9 6	do		622	do 26..	2 6	10 0	do	
623	do 26..	2 6	9 6	do		623	do 26..	2 6	9 0	do	
624	do 26..	3 0	5 0	do		624	do 26..	2 6	9 0	do	
625	do 26..	3 0	5 6	do		625	do 26..	2 6	9 0	do	
626	do 26..	2 6	10 0	do		626	do 26..	2 6	10 0	do	
627	do 26..	2 6	9 0	do		627	do 26..	2 6	8 0	do	
628	do 26..	2 6	10 0	do	4 miles.	628	do 26..	2 6	10 0	do	4 miles.

SECTION 5.

629	do 26..	2 6	10 0	do		629	do 26..	2 6	10 0	do	
630	do 26..	2 6	6 0	do		630	do 26..	9 0	2 0	do	
631	do 26..	2 6	9 0	do		631	do 28..	2 6	10 0	do	
632	do 26..	2 6	10 0	do		632	do 28..	2 6	14 0	do	
633	do 26..	3 0	8 0	do		633	do 28..	2 6	14 0	do	
634	do 26..	2 6	8 0	do		634	do 28..	2 6	8 0	do	
635	do 26..	2 6	10 0	do		635	do 28..	2 6	10 0	do	
636	do 26..	3 0	9 0	do		636	do 28..	2 6	7 0	do	
637	do 26..	2 6	9 0	do		637	do 28..	2 6	8 0	do	
638	do 26..	2 6	10 0	do		638	do 28..	2 6	9 0	do	
639	do 26..	2 6	12 0	do		639	do 28..	2 6	8 0	do	
640	do 26..	2 6	9 0	do		640	do 28..	2 6	9 0	do	
641	do 26..	2 6	7 0	do		641	do 28..	2 6	9 0	do	
642	do 26..	2 6	8 0	do		642	do 28..	3 0	8 0	do	
643	do 26..	2 6	10 0	do		643	do 28..	3 0	9 0	do	
644	do 26..	2 6	9 0	do		644	do 28..	3 0	9 0	do	
645	do 26..	2 6	6 0	do	4½ miles.	645	do 28..	2 6	8 0	do	4½ miles.
646	do 26..	2 6	6 0	do		646	do 28..	2 6	10 0	do	
647	do 26..	2 6	6 0	do		647	do 28..	2 6	6 0	do	
648	do 26..	2 6	6 0	do		648	do 28..	2 6	9 0	do	
649	do 29..	2 6	9 0	do		649	do 28..	3 0	10 0	do	
650	do 29..	2 6	12 0	do		650	do 28..	3 0	5 6	do	
651	do 29..	2 6	12 0	do		651	do 28..	3 0	8 0	do	
652	do 29..	2 6	12 0	do		652	do 28..	3 0	5 6	do	

TABLE showing Ice, Frazil, &c.—Continued.

SECTION 5.—Continued.

NORTH SIDE.					SOUTH SIDE.						
Station.	Date.	Ice, Frazil Charge			Remarks.	Station.	Date.	Ice, Frazil Charge			Remarks.
653	Mar. 28	3 0	10 0	5 lbs.		653	Mar. 28	3 0	9 0	5 lbs.	
654	do 29	2 6	10 0	do		654	do 31	3 0	15 0	do	
655	do 29	2 6	9 0	do		655	do 31	3 6	15 0	do	
656	do 29	2 6	8 0	do		656	do 31	3 0	15 0	do	
657	do 29	2 6	10 0	do		657	do 31	3 0	15 0	do	
658	do 29	2 6	9 0	do		658	do 31	2 6	12 0	do	
659	do 29	2 6	8 0	do		659	do 31	2 6	15 0	do	
660	do 29	2 6	12 0	do		660	do 31	2 6	12 0	do	
661	do 29	2 6	6 0	do		661	do 31	2 6	12 0	do	
662	do 29	2 6	9 0	do		662	do 31	2 6	12 0	do	
663	do 29	2 6	12 0	do		663	do 31	3 0	15 0	do	
664	do 29	2 6	12 0	do		664	do 31	2 6	12 0	do	
665	do 29	2 6	9 0	do		665	do 31	3 0	12 0	do	
666	do 29	2 6	12 0	do		666	do 31	3 0	18 0	do	
667	do 29	3 0	10 0	do		667	April 1	4 0	15 0	do	
668	do 29	2 6	8 0	do		668	do 1	2 0	12 0	do	
669	April 1	2 6	10 0	do		669	do 1	3 0	15 0	do	
670	April 1	2 0	10 0	do	5 miles.	670	April 1	2 6	12 0	do	5 miles.

SECTION 6.

671	do 1	2 6	12 0	do	671	do 1	2 6	21 0	do
672	do 1	2 6	8 0	do	672	do 1	2 6	15 0	do
673	do 1	2 6	12 0	do	673	do 1	2 6	12 0	do
674	do 1	2 6	12 0	do	674	do 1	2 6	21 0	do
675	do 1	2 6	10 0	do	675	do 1	2 6	15 0	do
676	do 1	2 0	10 0	do	676	do 1	2 6	12 0	do
677	do 1	2 6	16 0	do	677	do 1	3 0	15 0	do
678	do 1	2 6	12 0	do	678	do 1	2 6	12 0	do
679	do 1	2 6	15 6	do	679	do 1	2 6	15 6	do
680	Mar. 31	3 0		do	680	Mar. 31	3 0		do
681	do 31	2 6		do	681	do 31	2 6		do
682	do 31	3 0		do	682	do 31	3 0		do
683	do 31	3 0		do	683	do 31	3 0		do
684	do 31	3 0		do	684	do 31	3 0		do
685	do 31	2 6		do	685	do 31	2 6		do
686	do 31	2 6		do	686	do 31	2 6		do
687	do 31	2 6		do	687	do 31	2 6		do
688	do 31	3 0		do	688	do 31	3 0		do
689	do 31	2 6		do	689	do 31	2 6		do
690	do 31	2 6		do	690	do 31	2 6		do
691	do 31	2 6		do	691	do 31	2 6		do
692	do 31	2 6		do	692	do 31	2 6		do
693	do 31	2 6		do	693	do 31	2 6		do
694	do 31	3 0		do	694	do 31	3 0		do
695	do 31	3 0		do	695	do 31	3 0		do
696	do 31	2 6		do 5 1/2 miles.	696	do 31	2 6		do
697	do 31			do	697	do 31	2 6		do
698	do 31			do	698	April 1	3 6	14 0	do
699	do 31	2 6	8 0	do	699	do 8	3 4	10 0	do
700	do 31	2 6	8 0	6 1/2 lbs.	700	do 8	3 6	11 0	6 1/2 lbs.
701	do 31	2 8	10 0	do	701	do 8	3 0	9 0	do
702	do 31	2 6	19 0	do	702	do 8	3 0	10 0	do
703	do 31	2 0	10 0	do	703	do 8	2 10	11 0	do
704	do 31	2 6	23 0	do	704	do 8	2 8	15 0	do
705	do 31	1 10	27 0	do	705	do 8	2 0	17 0	do
706	do 31	1 0	35 0	do	706	do 8	2 8	18 0	do
707	do 31	2 0	35 0	do	707	do 8	3 0	20 0	do
708	do 31	1 0	40 0	do	708	do 8	2 0	24 0	do
709	do 31	1 9	40 0	do	709	do 8	2 4	24 0	do

TABLE showing Ice, Frazil, &c.—Continued.

SECTION 6—Continued.

Station.	Date.	NORTH SIDE.			Remarks.	Station.	Date.	SOUTH SIDE.			Remarks.
		Ice.	Frazil	Charge				Ice.	Frazil	Charge	
710	April 7..	1 6	40 0	6½ lbs.		710	April 8..	2 0	11 0	6½ lbs.	
711	do 7..	2 0	37 0	do		711	do 8..	2 0	24 0	do	
712	do 7..	1 10	26 0	do		712	do 8..	2 0	24 0	do	
713	do 7..	1 10	29 0	do		713	do 8..	2 8	13 0	do	
714	do 7..	2 0	30 6	do		714	do 8..	2 0	19 0	do	
715	do 7..	1 8	29 0	do		715	do 8..	2 0	20 0	do	
716	do 7..	2 0	30 0	do		716	do 8..	2 4	17 0	do	
717	do 7..	3 0	26 0	do		717	do 8..	4 6	11 0	do	
718	do 7..	3 0	29 0	do		718	do 8..	3 0	13 0	do	
719	do 7..	3 3	25 0	do		719	do 8..	3 0	11 0	do	
720	do 7..	2 6	25 0	do		720	do 8..	2 6	12 0	do	
721	do 7..	4 0	22 0	do		721	do 8..	3 0	11 0	do	
722	do 7..	2 6	30 0	do		722	do 8..	3 4	8 0	do	
723	do 7..	3 0	24 0	do	6 miles.	723	do 8..	3 0	10 0	do	6 miles.

SECTION 7.

724	do 7..	3 0	25 0	do		724	do 8..	3 0	9 0	do	
725	do 7..	5 0	26 6	do		725	do 8..	3 0	9 0	do	
726	do 7..	2 9	25 0	do		726	do 8..	3 0	9 0	do	
727	do 7..	3 0	26 0	do		727	do 8..	3 0	9 0	do	
728	do 7..	3 0	25 0	do		728	do 8..	3 9	11 0	do	
729	do 7..	3 6	25 0	do		729	do 8..	3 0	8 0	do	
730	do 7..	2 6	25 0	do		730	do 8..	3 0	12 0	do	
731	do 7..	2 6	25 0	do		731	do 8..	3 0	9 0	do	
732	do 7..	3 6	25 0	do		732	do 8..	3 0	9 0	do	
733	do 7..	2 6	22 0	do		733	do 8..	3 4	15 0	do	
734	do 7..	3 6	20 0	do		734	do 8..	3 6	15 0	do	
735	do 8..	3 0	21 0	do		735	do 8..	3 0	11 0	do	
736	do 8..	2 6	19 0	do		736	do 8..	4 0	21 0	do	
737	do 8..	3 9	19 0	do		737	do 8..	3 3	32 0	do	
+50	do 8..	...	...	do		+50	do 8..	...	...	do	
738	do 8..	3 6	20 0	do		738	do 8..	3 0	33 0	do	
+50	do 8..	...	...	do		+50	do 8..	...	...	do	
739	do 9..	4 0	21 0	do		739	do 8..	2 6	32 6	do	
+50	do 8..	...	...	do		+50	do 8..	...	...	do	
740	do 8..	3 6	18 0	do		740	do 8..	3 6	32 0	do	
+50	do 8..	...	...	do		+50	do 8..	...	...	do	
741	do 8..	3 2	22 0	do		741	do 8..	3 6	30 0	do	
+50	do 8..	...	...	do		+50	do 8..	...	...	do	
742	do 8..	3 9	23 0	do		742	do 8..	3 0	31 0	do	
+50	do 8..	...	...	do		+50	do 8..	...	...	do	
743	do 8..	2 10	23 0	do		743	do 8..	3 6	35 0	do	
+50	do 8..	...	...	do		+50	do 8..	...	...	do	
744	do 8..	2 6	23 0	do		744	do 8..	2 0	24 0	do	
+50	do 8..	...	...	do		+50	do 8..	...	...	do	
745	do 8..	2 0	23 0	do		745	do 8..	2 6	16 0	do	
+50	do 8..	...	...	do		+50	do 8..	...	...	do	
746	do 8..	3 2	22 0	do		746	do 8..	2 4	18 0	do	
747	do 8..	3 0	19 0	do		747	do 8..	2 6	22 0	do	
748	do 8..	2 0	26 0	do		748	do 8..	3 6	16 0	do	
749	do 8..	3 6	27 0	do	6½ miles.	749	do 8..	2 3	23 0	do	6½ miles.
750	do 8..	3 0	22 0	do		750	do 8..	3 2	19 0	do	
751	do 8..	2 8	18 0	do		751	do 8..	3 0	17 0	do	
752	do 8..	2 6	18 0	do		752	do 8..	2 6	29 0	do	
753	do 8..	2 6	22 0	do		753	do 8..	3 6	21 0	do	
754	do 8..	2 8	20 0	do		754	do 8..	3 4	19 0	do	
755	do 8..	2 6	15 0	do		755	do 8..	2 6	15 0	do	
756	do 8..	2 0	17 0	do		756	do 8..	2 0	23 0	do	
757	do 8..	2 0	19 0	do		757	do 8..	3 6	18 0	do	

TABLE showing Ice, Frazil, &c.—Continued.

SECTION 7—Continued.

Station.	Date.	NORTH SIDE.			Remarks.	Station.	Date.	SOUTH SIDE.			Remarks.
		Ice	Frazil	Charge				Ice	Frazil	Charge	
758	April 8	2 0	10 0	6½ lbs.		758	April 8			6½ lbs.	
759	do	2 0	9 0	do		759	do			do	
760	do	2 6	14 0	do		760	do			do	
761	do		20 0	do		761	do			do	
762	do		21 0	do		762	do			do	
763	do		30 0	do		763	do			do	
764	do		20 0	do		764	do			do	
765	do		17 0	do		765	do			do	
766	do		17 0	do		766	do			do	
767	do		15 0	do		767	do			do	
768	do		17 0	do		768	do			do	
769	do		16 0	do		769	do			do	
770	do		15 0	do		770	do			do	
771	do		16 0	do		771	do			do	
772	do		17 0	do		772	do			do	
773	do		17 0	do		773	do			do	
774	do		17 0	do		774	do			do	
775	do		19 0	do	7 miles.	775	do			do	7 miles.

SECTION 8

776	do		19 0	do		776	do		10 0	do	
777	do		19 0	do		777	do		9 0	do	
778	do		18 0	do		778	do		12 0	do	
779	do		18 0	do		779	do		7 0	do	
780	do		18 0	do		780	do		10 0	do	
781	do		18 0	do		781	do		10 0	do	
782	do		20 0	do		782	do		10 0	do	
783	do		20 0	do		783	do		12 0	do	
784	do		20 0	do		784	do		15 0	do	
785	do		20 0	do		785	do		12 0	do	
786	do		20 0	do		786	do		15 0	do	
787	do		20 0	do		787	do		12 0	do	
788	do		20 0	do		788	do		13 0	do	
789	do		22 0	do		789	do		15 0	do	
790	do		21 0	do		790	do		15 0	do	
791	do		22 0	do		791	do		20 0	do	
792	do		12 0	do		792	do		12 0	do	
793	do		do	do		793	do		do	do	
794	do		do	do		794	do		do	do	
795	do		do	do		795	do		do	do	
796	do		do	do		796	do		do	do	
797	do		do	do		797	do		do	do	
798	do		do	do		798	do		do	do	
799	do		do	do		799	do		do	do	
800	do		do	do		800	do		do	do	
801	do		do	do		801	do		do	do	

Frazil and shaved ice, very uniformly, to 14 ft.

Frazil and shaved ice, very uniformly, to 14 ft.

TABLE showing Ice, Frazil, &c.—Continued.

SECTION 8—Continued.

Station.	Date.	NORTH SIDE.			Remarks.	Station.	Date.	SOUTH SIDE.			Remarks.
		Ice.	Frazil	Charge				Ice.	Frazil	Charge	
802	April 8.	Frazil and shoved ice, very uniformly, 12 to 14 ft.		6½ lbs.	7½ miles.	802	April 8.			6½ lbs.	
803	do 8.			do		803	do 8.			do	
804	do 8.			do		804	do 8.			do	
805	do 8.			do		805	do 8.			do	
806	do 8.			do		806	do 8.			do	
807	do 8.			do		807	do 8.			do	
808	do 8.			do		808	do 8.			do	
809	do 8.			do		809	do 8.			do	
810	do 8.			do		810	do 8.			do	
811	do 8.			do		811	do 8.			do	
812	do 8.			do		812	do 8.			do	
813	do 8.			do		813	do 8.			do	
814	do 8.			do		814	do 8.			do	
815	do 8.			do		815	do 8.			do	
816	do 8.			do		816	do 8.			do	
817	do 8.			do		817	do 8.			do	
818	do 8.			do		818	do 8.			do	
819	do 8.			do		819	do 8.			do	
820	do 8.	Frazil and shoved ice, very uniformly, 12 to 14 ft.		do		820	do 8.			do	
821	do 8.			do		821	do 8.			do	
822	do 8.			do		822	do 8.			do	
823	do 8.			do		823	do 8.			do	
824	do 8.			do		824	do 8.			do	
825	do 8.			do		825	do 8.			do	
826	do 8.			do		826	do 8.			do	
827	do 8.			do		827	do 8.			do	
828	do 8.			do	8 miles.	828	April 8.			do	8 miles.

SECTION 9.

829	April 8.	Frazil and shoved ice, very uniformly, 12 to 14 ft.		6½ lbs.		829	do 8.			6½ lbs.	
830	do 8.			do		830	do 8.			do	
831	do 8.			do		831	do 8.			do	
832	do 8.			do		832	do 8.			do	
833	do 8.			do		833	do 8.			do	
834	do 8.			do		834	do 8.			do	
835	do 8.			do		835	do 8.			do	
836	do 8.			do		836	do 8.			do	
837	do 8.			do		837	do 8.			do	
838	do 8.			do		838	do 8.			do	
839	do 8.			do		839	do 8.			do	
840	do 8.			do		840	do 8.			do	
841	do 8.			do		841	do 8.			do	
842	do 8.			do		842	do 8.			do	
843	do 8.			do		843	do 8.			do	
844	do 8.			do							
845	do 8.			do							
846	do 8.			do							
847	do 8.			do							

EXTRAIT.

RAISON DE CE QUI S'EST PASSÉ EN LA NOUVELLE FRANCE EN L'ANNÉE 1643, PAR LE
P. BARTHÉLÉMY VIMONT, S. J.

CHAPITRE XI.

De ce qui s'est passé à Montréal.

Dieu nous a fait voir le soin qu'il prend de cette habitation, la défendent et
protègent contre les eaux, qui par une creuse extraordinaire la menaceront d'une ruine
telle, s'il n'en eût par sa providence arrêté le cours; elles couvrent en peu de
temps les prairies et les lieux voisins du fort; chacun se retire à la vue de cette
inondation, qui s'augmentoît toujours, dans l'endroit le plus assuré. On a recours
aux prières. Monsieur de Maison-Neuve se sent poussé intérieurement d'aller
planter une croix au bord de la petite rivière, au pied de laquelle est bastie l'habita-
tion, qui commençoit à se déborder, pour prier sa divine Majesté de la retenir dans
ses bornes ordinaires, si cela devoit être pour sa gloire, ou de leur faire connoître le
bien qu'il vouloit estre servy par ces Messieurs de Montréal, afin d'y mettre le prin-
cipal établissement, au cas qu'il permit que les eaux vinssent à perdre ce qu'on venoit
de leur ôter.

Il proposa aussitôt ce sentiment aux Pères, qui le trouvèrent bon: il l'escrit sur
une feuille de papier, le fait lire publiquement afin qu'on reconnust la pureté de
son intention, s'en va planter la Croix que le Père bénit, au bord de la rivière avec
un couteau qu'il attache au pied, s'en retourne avec promesse qu'il fait à Dieu de porter
cette croix luy seul sur la montagne de Mont-Royal, s'il luy plaist accorder sa
prière.

Les eaux néanmoins ne laisserent pas de passer outre. Dieu voulant es-
prouver sa bonté. On les voyoit rouler de grosses vagues, coup sur coup, remplir les fosses
et monter jusque à la porte de l'habitation, et sembler devoir engloûtir tout
ce qui estoit dedans: chacun regarde ce spectacle sans trouble, sans crainte, sans mur-
mure, croyant que ce fust au cœur de l'hiver, en plein minuit, et lors mesme qu'on
alloit célébrer la Naissance du Fils de Dieu en terre.

Le bon Sieur de Maison-Neuve ne perd pas courage, espère voir bientôt l'effet
de sa prière, qui ne tarda guère, car les eaux après s'estre arrêtées peu de temps au
bord de la porte sans croître davantage, se retirent peu à peu, mettant les habitants
à l'aise, et la Capitaine dans l'exécution de sa promesse.

L. H. SYLVAIN.

Library of Parliament.

NOTICE ASKING INSTRUCTIONS.

MONTREAL FLOOD COMMISSION.

The Commissioners appointed by the Dominion Government to enquire into the
causes of the floods at Montreal, and to suggest the necessary remedies to prevent
their recurrence, are now prepared to receive communications in writing from
particular persons desirous of submitting their views upon this question. Those who desire to
express their views verbally to the Commission will please state this and they will
be called when the Commissioners can meet for that purpose.

The Commissioners are desirous of obtaining all reliable information from
existing land marks, or recorded observations, as to the extreme height of the winter
floods, more especially as to that of the winter of 1837-38, the various points of ice
which have been above, opposite and below the city, upon either shore, whether regular or

exceptional; the sites of ice dams, duration and effect of same, or any other facts bearing on the causes of the floods.

Also any records showing the dates on which the ice has taken, closed over and become a winter road; and those at which it has opened, broken up and moved out in Lake St. Louis, Laprairie Basin and points between Hochelaga and Sorel.

Please address,

"MONTREAL FLOOD COMMISSION,"

P. O. Box 2017, MONTREAL.

THOS. C. KEEFER, *Chairman.*

MONTREAL, 19th June, 1886.

INDEX TO DIAGRAMS, CHARTS, PROFILES, ETC.

DIAGRAMS OF WATER LEVEL.

1. Average diagram at Toronto for 36 years ending 1887.
2. Average diagram at Montreal for 36 years ending 1887.
3. Average diagram at Ottawa for 36 years ending 1887, on the 1st, 8th, 15th and 22nd of each month, also highest and lowest water on these dates.
4. Gaugings at Montreal, Ottawa and Toronto on flood, and non-flood years, in Montreal.
5. Gaugings at Montreal, Ottawa and Toronto, 1852-1887.
6. Gaugings at Ottawa, 1852-1887.
7. Gaugings at Toronto, 1852-1887.
8. Diagram of water fluctuations in Montreal Harbour at Lock No. 1, Lachine Canal, during the time of the taking of the ice in 1885-86, 1886-87, 1887-88.
9. Diagrams of water fluctuations in Montreal Harbour at Lock No. 1, Lachine Canal, during the time of the breaking up of the ice in 1885-86, 1886-87, 1887-88.
10. River levels at Montreal, winter 1887.
11. do do spring 1887.
12. do do winter 1886.
13. do do spring 1886.
14. do do winter 1885.
15. do do spring 1885.
16. do do winter 1884.
17. do do spring 1884.
18. do do winter 1883.
19. do do spring 1883.
20. Diagrams showing the highest and lowest winter and spring levels of River St. Lawrence from 1883-1888.
21. Winter and summer profiles in St. Lambert and main channels.
22. Diagram showing simultaneous gaugings at Laprairie, St. Lambert, Montreal, Hochelaga, Longue Pointe, Boucherville, Varennes and Sorel, December to April, 1886-87.
23. Water profiles, Laprairie to Longue Pointe, showing low water, winter level and flood lines of April, 1887.
24. Profiles of River St. Lawrence from Pointe Claire to Sorel.
25. Diagram of weather and water at Montreal, showing maximum, mean and minimum temperatures (from November to April, 1838-1887); also amount of weather below zero.
26. Diagram of water levels at Three Rivers, 1881-86.

CROSS SECTIONS OF RIVER ST. LAWRENCE.

From Lake St. Louis to Lake St. Peter (both inclusive) Scales:— Horizontal 100 feet to an inch; Vertical 10 feet to an inch.

27. Cross-sections on Lake St. Louis.
28. do Lachine Rapids to Victoria Bridge.
29. do Victoria Bridge to Hochelaga.
30. do Hochelaga to Longue Pointe.

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| 6 | 31. | Cross Sections on Hochelaga to Longue Pointe. |
| 7 | 32. | do do do |
| 8 | 33. | do do do |
| 9 | 34. | do do do |
| 10 | 35. | Longue Pointe to Pointe aux Trembles. |
| 11 | 36. | Pointe aux Trembles to Varennes. |
| 12 | 37. | Varennes to Verchères. |
| 13 | 38. | Lanoraie to Lake St. Peter. |

CROSS SECTIONS OF RIVER ST. LAWRENCE.

Islands, &c., from Lake St. Louis to Lake St. Peter (both inclusive.) Scales:—Horizontal, 400 feet to an inch; Vertical, 40 feet to an inch.

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| 39. | Cross-sections in Lake St. Louis. |
| 40. | do Lachine Rapids to Victoria Bridge. |
| 41. | do Victoria Bridge to Hochelaga. |
| 42. | do Hochelaga to Longue Pointe. |
| 43. | do do do |
| 44. | do do do |
| 45. | do do do |
| 46. | do do do |
| 47. | do Longue Pointe to Pointe aux Trembles. |
| 48. | do Pointe aux Trembles to Varennes. |
| 49. | do Varennes to Verchères. |
| 50. | do Lanoraie to Lake St. Peter. |
| 51. | Plan showing position of cross-sections, distribution of ice, frazil and free water, also longitudinal section of river from Lachine Rapids to Varennes. |
| 52. | Cross-sections of St. Helen's Island. |
| 53. | do of Moffatt's Island. |
| 54. | do of Ile Ronde. |
| 55. | do of River St. Lawrence below Pointe aux Trembles. |
| 56. | do of River St. Lawrence near Lanoraie. |
| 57. | Longitudinal section and distribution of frazil, ice and water. Scale, 3,000 feet to 1 inch. |
| 58. | Soundings, mean cross-section, currents and discharge of River St. Lawrence near Lanoraie. |
| 59. | Cross-sections and diagrams of currents in Lake St. Peter in March, 1887. |
| 60. | do of proposed embankment at Point St. Charles and St. Gabriel. |
| 61. | Plan showing positions of ice cross sections taken in winter 1886-87. Scale 6,000 feet to 1 inch. |
| 62. | Cross-sections of ice, frazil, &c., Victoria Bridge to Hochelaga, March, 1882. Scales:—Horizontal, 100 feet to 1 inch; Vertical, 10 feet to 1 inch. |
| 63. | Cross sections of ice, frazil, &c., Victoria Bridge to Hochelaga, March, 1883. Scales:—Horizontal, 100 feet to 1 inch; Vertical, 10 feet to 1 inch. |
| 64. | Cross-sections of ice, frazil and water, between Victoria Bridge and Hochelaga in winter 1881-2. Scales:—Horizontal, 400 feet to 1 inch; Vertical, 40 feet to 1 inch. |
| 65. | Cross-sections of ice, frazil and water, between Victoria Bridge and Hochelaga, winter 1882-3. Scales:—Horizontal, 400 feet to 1 inch; Vertical, 40 feet to 1 inch. |

PROGRESS DIAGRAMS SHOWING THE TAKING OF THE ICE IN THE WINTER OF 1886-87.

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| 66. | Diagrams in Lake St. Louis. |
| 67. | Diagrams between Lachine Rapids and Montreal. |
| 68. | do do do |
| 69. | do do do |

70. Diagrams between Montreal and Verchères.
 71. do do do
 72. do do do
 73. Diagram between Lanoraie and Sorel.
 74. Diagram between Sorel and upper part of Lake St. Peter.
 75. Diagram between Champlain and Cap à la Roche.
 76. Diagram between Cap à la Roche and Platon.

DIAGRAMS SHOWING CONDITIONS OF THE ICE IN THE RIVER ST.
LAWRENCE IN THE WINTER OF 1886-87.

77. Diagram between Morrisburg and Dickinson's Landing.
 78. Diagram in lower end of Lake St. Francis.
 79. Diagram in Lake St. Louis.
 80. Diagram at Boucherville Islands.
 81. Diagram between Grondines and Platon.

PROGRESS DIAGRAMS SHOWING BREAKING UP OF ICE IN WINTER
OF 1886-87.

82. Diagram in Lake St. Louis.
 83. Diagram between Lachine Rapids and Montreal.
 84. do do do
 85. do do do
 86. do do do
 87. Diagram between Longue Pointe and Bout de l'Île.
 88. Diagram between Bout de l'Île and Contrecoeur.

CHARTS.

89. Charts of Lake St. Francis (Cornwall to Lancaster Light).
 90. Of Lake St. Francis (Lancaster Light to Province Line).
 91. Of Lake St. Francis (McKee's Point to Valleyfield).
 92. From Lake St. Francis to Lake St. Louis.
 93. From Coteau Landing to Pointe à Pelladeau in Lake St. Louis.
 94. Of Lake St. Louis.
 95. Of Lake St. Louis, showing 14 feet shoal line.
 96. Hydraulic survey of Lake St. Louis.
 97. Of part of Lake St. Louis showing proposed piers and booms.
 98. Plan showing bench marks, Pointe Claire to Sorel.
 99. Plan showing currents, Lachine Rapids to St. Helen's Island.
 100. Plan showing soundings above Victoria Bridge.
 101. Land flooded from Boucherville to Laprairie, 18th April, 1886.
 102. Depth of water in streets of Montreal, 18th April, 1886.
 103. Plan of Montreal Harbour, showing islands in St. Lambert Channel.
 104. Plan of Montreal Harbour, showing depths of water and frazil.
 105. Plan of Harbour of Montreal, showing main reef across river from Point St. Charles to St. Lambert.
 106. Plan showing blasted channel from Montreal to Varennes, position of blast holes, condition of ice, &c.
 107. Plan of Lake St. Peter, showing condition of ice and velocity of currents, winter of 1886-87.
 108. Plan of River Ottawa at Deux Rivières, showing effect of ice bridge artificially formed by boom.
 109. Plan of alternate locations for proposed embankment at Point St. Charles and St. Gabriel.

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110. Area covered by flood of April, 1886, and proposed dyke for Point St. Charles and St. Gabriel, with drainage works.
 111. Plan of Montreal, from tail-race of Water works to mouth of Lachine Canal, showing proposed embankment.
 112. Profile of alternate locations for proposed embankment at Point St. Charles and St. Gabriel.
 113. Profile of lower Lachine Road.
 114. Plan of the River St. Lawrence, from Lake St. Peter to Platon, showing condition of ice in March and April, 1887. Scale, 10,140 feet to 1 inch.

ALPHABETICAL RECORD.

ENGINEERS AND SUPERINTENDENTS, ETC.

AND THE

PRINCIPAL PUBLIC WORKS,

ON WHICH THEY HAVE REPORTED OR BEEN EMPLOYED,

CANADA,

1779 TO 1891.

BY

G. F. BAILLAIRGÉ

Deputy Minister of Public Works.

APPENDICES.

PART III.

APPENDIX No. 19.

ALPHABETICAL RECORD.

ENGINEERS AND THEIR ASSISTANTS, ETC., EMPLOYED

ON

PUBLIC WORKS, CANADA,

1779 to 1891.

*N.B.—This Record does not contain the names of the Government Railway
Engineers.*

ENGINEERS

Employed on Public Works, Canada, 1779 to 1891, so far as ascertained, exclusive of Railways.

Engineers.	Works.	Dates of Employment, &c.
Asst. Eng. J. C.	Assistant Engineer, Harbours, Maritime Provinces Resident Engineer, St. John, N.B.; Works and Surveys, King's, Annapolis, Digby, Yarmouth, Shelburne, Queen's and Lunenburg Counties, Nova Scotia	Oct., 1883-88. July, 1889-90.
Asst. Eng. J. C.	Report on Saint Ste-Marie Canal to Legislature, state of Michigan previous to See Report of Hon. H. H. Killaly	1847. 30th March, 1847.
Asst. Eng. W. F.	Chief Engineer, Department of Marine and Fisheries Member Canadian Society of Civil Engineers	23rd Oct., 1874-91 20th Jan'y, 1887.
Asst. Eng. Capt. Charles Asst. Eng.	Lake St. Peter, dredging, &c.	1857-57.
Asst. Eng. Capt. Roger	Chief Mechanical Engineer Superintendent dredge vessels and dredging, Ontario and Quebec Mechanical Engineer, Public Buildings, Ottawa Member Canadian Society of Civil Engineers	6th Dec., 1879. 1880-91. 7th July, 1883-91. 25th June, 1887.
Asst. Eng. Capt. Captain.	Engineer Royal Artillery, first attempt to place a cable for Suspension Bridge at Ottawa	1826
Asst. Eng. Charles	Lake St. Peter, dredging, in charge of surveys and investi- gations Specification of dredge vessels, &c. Superintending Engineer, Lake St. Peter improvements,	1842-43. 9th Sept., 1842. Aug., 1843
Asst. Eng. F.	Chantry Island breakwater, Lake Huron, &c. Harbour Surveys, Maritime Provinces River Ottawa bridge-site survey at Portage du Fort, &c.	1875-82. 1883-84 1885-90.
Asst. Eng. J. A.	Lachine Canal enlargement, engineering staff. St. Anne Lock Resident Engineer, new locks and canals, River Trent construction Member Canadian Society of Civil Engineers A partner in the contracting firm of Manning & McDonald, Toronto	July, 1873-79 do 1880-81 June, 1882-88 20th Jan'y, 1887 1888-91.
Asst. Eng. Capt. R. E.	Commissioner with Hon. John Macaulay, Surveyor-General, and John S. Cartwright, under Act of Upper Canada Parliament, for ascertaining practicability of making a navigable communication between the Ottawa and Lake Huron They reported to Sir George Arthur, and in re- sponse to the report of David Taylor, David Thompson and William Hawkins, the per- sons they employed to survey the route See subsequent reports on surveys by Walter Smith and James Stewart, in 1847-48, and by Thomas C. Clark, 1849-50 See Appendix 36, pages 847 to 847, by G. F. Fox large in General Report of Public Works, 1867-82.	4th March, 1847

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Baillairgé, Charles	Architect of numerous public buildings, churches, residences, mills, manufactories, &c. Architect and Engineer, Public Works, Quebec and Ottawa Architect of, and report on new gaol, Quebec. Joint Architect, Ottawa Parliament Buildings. Treatise on Geom., Trig., Rect. and Sph., with tables, &c., 900 pages. City Engineer, Quebec. New treatise on Stereometry. First medal of Society of Arts and Manufactures, Paris, and thirteen medals and seventeen diplomas awarded by France, United States, Russia, Spain, Italy, Japan, Brazil, Canada, &c. Princess Louise Docks, Quebec, plans submitted, &c. Inspecting Engineer North Shore Railway, Quebec to Montreal, and Piles Branch, River St. Maurice. Fellow Royal Canadian Academy of Arts. Fellow Royal Society of Canada. Member of Canadian Society of Civil Engineers. Inspecting Engineer of Quebec and Lake St. John Railway for Municipal Council of Quebec. Engineer of New Aqueduct, Quebec. Member of the Society of Sciences, Arts, Letters &c., London, Eng. Member of "l'Académie des Palmiers," France. Design for proposed London Tower, 1,600 feet high.	1840-60. 1860-63. 11th Feb., 1863. 1863-65. 1866. 6th Oct., 1866-91. 15th March, 1874 to 1884. 1874-76. 1875-81. 1880. 7th March, 1882. 3rd Feb., 1887. 1883-91. 1885-91. Dec., 1886. 12th May, 1889. 1890.
Baillairgé, George Fred.	Canals, harbours, roads, Provinces of Quebec and Ontario. First General Report on Public Works, with James Stewart, C. E. Laid out the first slides built on the River St. Maurice, at Grand-Mère and Shawenigan Falls. Surveys—Piers below Quebec, River l'Assomption, &c. Resident Engineer, Junction and Williamsburgh Canals. Ordnance canals, survey and plans of hydraulic lots at Cascades, Split Rock, Cedars, and Côte du Lac, with estimates. Chambly and Beauharnois Canals, surveys and claims. Saguenay, Metapediae, Gaspé and Temiscouata Roads, &c. Second General Report on Public Works. Cornwall, Beauharnois Canal weirs, &c. Channel sounded, River St. Lawrence, between Quebec and Montreal. Baie Verte Canal Survey, proposed route and design. Location and design of lock, Lakes Muskoka and Ronseau. Slides and booms, Rivers Saguenay, St. Maurice and Trent Assistant Chief Engineer Public Works, Canada. Proposed Cedars Canal and River St. Lawrence survey. Fort Frances Lock, Rainy Lake, and survey harbour Works, Quebec. Superintending Engineer Canals, Province of Quebec. Deputy Minister Public Works, Canada. Third General Report on Public Works. Classified collections of specifications of the Public Works of Canada, chiefly from. New Map of Canada, and Book of Reference containing Historical Synopsis—showing its resources, climate, &c., &c., and comprising the various Arctic discoveries up to. Member of Council, Canadian Society of Civil Engineers.	22nd Sept., 1844. Up to 1849. Sept.-Oct., 1852. 1846-1853. 1853-1856. 1857. 1849-1864. 1858 to 1866. 1st July, 1867. 1856-1870. 1868-1869. Aug., 1870-73. June, July, 1866. 1863-78. 5th July, 1871-79. 1872-73, 1875-76. 1875-76. 22nd June, 1877-79. 4th Oct., 1879-91. 1867-82. 1841 to 1890. 1890-91. 1889-90.
Bailey, C. E.	From Kingston, Ontario, Provincial Engineer, P.E.I. Died 1882. No successor appointed.	1877 to 1882.
Baird, N. H.	Engineering Staff, Rideau Canal. Member of Institute of Civil Engineers, England.	1828-32. 1831.

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Baird, N. H.	Projected Murray Canal, Lake Ontario..... Report on Beauharnois Canal project..... do on River Trent navigation and Sup. Eng. of Works. Locks 134 by 33 feet; 5 feet water on sills. Work commenced 1837, and completed chiefly in 1844. do on Welland Canal enlargement..... Work commenced 30th November, 1824. Canal first opened 30th November, 1829. Original wooden locks 110 by 22 feet, with 7½ feet of water on sills. Reports on Roads and Bridges, Eastern Townships, P.Q.. Died, Aug., 1849, at Brattleboro', Vt.	1833. 1835. 1833-43. 1837. 1846-47-48.
Barclay, F. J.	Engineering Staff, St. Peter's Canal enlargement, Cape Breton	1875-81.
Barrett, Alfred.	Resident Superintending Engineer, Welland Canal..... Report Burlington Bay Canal..... Report on inland navigation between Lakes St. Francis and Ontario, also on Rapide Plat Canal project..... Grand River Navigation—Report..... Lachine Canal, 1st enlargement, and St. Ours lock and dam, &c..... Assistant Principal Engineer, locating Welland Canal..... Surveys, River St. Charles and bridges, River Ottawa, at Vaudreuil, &c..... Died, 18th July, 1849, at Montreal.	10th May, 1826. 1826. 1830. 7th Oct., 1843. 1841. 1842-43. 1843-48.
Barry, P. J. S.	Royal Engineer Corps. Report and estimate proposed St. Peter's Canal, Cape Bre- ton, N.S. Canal commenced by Nova Scotia Government..... do completed by Dominion Government..... This canal connects Great Bras-d'Or Lake and St. Peter's Bay, on the Atlantic. It is 2,400 feet in length, and has 1 tidal lock of 200 × 49½ × 18 feet depth of water on sills of lock, which has 4 gates. It was enlarged by Dominion Government, 1875 to 30th April, 1881. Cost of construction..... \$ 156,523 32, to 30th June, 1867. Cost of completion and enlargement 496,797 80, to 30th June, 1882. Total..... \$653,321 12 (See General Report, Public Works, 1867-82.) \$677,267.27 was the total expenditure on this work to 30th June, 1890.	31st Aug., 1853. 1854. 5th Aug., 1869.
Barfield, Admiral Henry W., R.N.	In charge of the Admiralty Survey of the River and Gulf of St. Lawrence..... Made reports respecting the deepening of Lake St. Peter..	1817-60. 1831-35-46.
Beaudry, J. A. U.	Engineering Staff, Public Works, harbour surveys, P.Q.. Member Canadian Society Civil Engineers.....	1883. 20th Jan., 1887.
Beckwith, Adolphus G..	Engineer, Department Public Works, N.B..... City Engineer, Fredericton, N.B..... Provincial Engineer, New Brunswick..... Member Canadian Society Civil Engineers.	1872-91. 1872-91. 1881-91. 20th Jan., 1887.
Belanger, Ernest.....	Assistant Engineer, harbour surveys, P.Q.....	1884-89.
Belcher, A. J.	Assistant Engineer, new canal works, River Trent.....	1882-88.
Belcher, Thos. Deaves..	Superintending Engineer, River Trent, canals, locks, slides, dams and booms, from Trenton, Lake Ontario, up to Lake Scugog	July, 1873, to 1884.

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Bell, Andrew	Engineer.—Survey Carillon and Grenville Canals Enl. New Carillon Canal on north side, also new slide on south side of the River Ottawa, and dam across the River Ottawa, Resident Engineer	June, 1870-72. June, 1872, to Nov. '85 1885-1891.
Bell, Capt.	Superintending dredging ship channel, Lake St. Peter. Died fall of 1856.	1852-56.
Bellingham, A.	Assistant Resident Engineer, Lachine Canal, third enlargement, upper division	1873 to 1878. Left service 1st October, 1878.
Bent, Capt., R. E.	Survey and Report Navigation St. John River, N.B.	1850.
Bender, E. P.	Engineering Staff, Public Works, harbours, Province of Quebec, &c.	1880 to 1887.
Bennett, William.	Resident Engineer, Esquimalt Graving Dock, Vancouver Island, British Columbia	1st Sept., 1883, to Jan., 1888.
Berlinguet, F. X.	Member Canadian Society of Civil Engineers	24th Feb., 1887.
Berlinguet, Thos.	Plans, specifications and estimates, Quebec Harbour Works First employed on survey Princess Louise Docks at Quebec. Survey, Harbour of Three River, &c., P.Q. Assistant, Hydrographic Survey, Pointe aux Trembles to Cap Charles	15th Dec., 1874. 1875-76. 1881-82. July, 1883.
	Resident Engineer, River St. Maurice, and Engineer Harbour Commissioners, Three Rivers, &c. Engineer in charge, lock and dam, River Yamaska, and various works at Sorel, River St. Francis, River Nicolet, and the St. Maurice Works. Member Canadian Society of Civil Engineers.	1884-89. 1888-91. 24th Feb., 1887.
Bertrand, Joseph Tétu.	Engineering Staff, Public Works, Ottawa, and harbour surveys, &c. Assistant Engineer, Levis Railway. Student Canadian Society of Civil Engineers. Assistant Engineer Surveys, Public Works.	1884-89. 1886-87. 20th Jan., 1887. 1889.
Bertrand, L. N.	Engineering Staff, Public Works, surveys, Quebec and Ontario	1884.
Billyard, W.	Assistant Engineer, Sarnia and Brantford Road, etc.	1843.
Blanchet.	do do Chambly Canal	1843-49.
Boivin, Elzéar	Harbour Survey, S.W. side, Lake St. John, P.Q.	1889.
Bolton, Capt. Daniel, R.E.	District Engineer, Rideau Canal (Bytown District)	1832-35.
	Report on tolls, Chaudière Bridge	1833.
	Description of dam at Long Island, on the Rideau Canal, built in 1836	1839.
	Was Major in 1839.	
Bonnycastle, Capt. R.H., R.E.	Report on preservation of York harbour (Toronto)	14th Jan., 1834.
Boswell, St. G.	Engineering Staff, Graving dock at Levis, and Princess Louise Basins, at Quebec	1876-88.
	Member of Council, Canadian Society of Civil Engineers.	1889.
	Resident Engineer, Quebec Harbour Works	1889-91.
Boulay, Phileas	Engineering Staff, canals, &c. Assistant, Cedars Canal survey. Lachine Canal enlargement. At head-quarters, Department Railways and Canals, &c. Died, 16th January, 1890.	15th March, 1870-71. 1872-76. 1877-80. 1880-89.

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Boxer, Capt., R.E.	Commander of H.M.S. "Hussar," surveying Gulf of St. Lawrence.....	1829.
	Survey and chart of River St. Lawrence—Report on St. Lawrence canals.....	1844.
	Report on Beauharnois Canal.....	4th June, 1845.
Boyd, John Edward ...	Resident Engineer, European and North American Railway, by Government of New Brunswick.....	1856-60.
	Chief Engineer and General Superintendent of E. and N.A. Railway.....	Dec., 1860-67.
	Assistant Engineer, Department Public Works, Ottawa.....	1st Sept., 1867-71.
	Chief Engineer of Government Railways, Prince Edward Island, for Provincial Government.....	10th May, 1871-75.
	Survey and report on navigation of River St. John, N.B.....	16th Nov., 1870.
	Resident Engineer, North Shore Railway, by Government of Quebec.....	1876 and 1879.
	Engineer in charge of works, Maritime Provinces.....	May, 1880, to June, 1881.
	Engineering Staff at head-quarters, Ottawa.....	1881-83.
	Resident Engineer, Princess Louise Basin, Quebec, and graving dock, Lévis, for Public Works Department....	Sept., 1883, to Nov., 1887.
	Died at Quebec and interred at Ottawa, Nov., 1887.	
Breen, Thomas	Engineering Staff, and afterwards in charge of various Public Works, harbours, &c., Province of Quebec.....	1882-91.
	Member Canadian Society of Civil Engineers.....	25th June, 1887.
Brophy, G. Patrick.....	Engineering Staff, Public Works.....	July, 1867.
	Assistant Superintending Engineer, Ottawa River works.....	1st July, 1873.
	Superintending Engineer do do.....	1st July, 1876-91.
	J. B. Brophy acted as Superintendent, 1st July, 1879, to 1880, during absence of G.P.B., on C.P.R.	
Brophy, John Byrne....	Assistant Superintending Engineer, Ottawa slides and booms.....	1st Jan., 1876.
	Superintending Engineer, Ottawa Slides and Booms.....	1st April, 1879.
	Resident Engineer on C.P.R. Railway.....	1st April, 1880.
	Divisional Engineer, Cape Breton Railway.....	28th June, 1886.
Brotherton, A. S.....	Engineering Staff, Public Works, harbour surveys, &c., below Quebec.....	1881-82.
Browne, Edward..	Report on back-waters, Newcastle District.....	18th Feb., 1858.
Browne, J. V.....	Engineer for Contractors, Quebec Harbour Works.....	1875.
Brown, Gustavus A.....	Assistant Engineer, Public Works, Maritime Provinces.....	1st July, 1872-88.
	Resident Engineer, St. John, N.B., Public Works and surveys, Prince Edward Island, and the Counties of Cumberland, Colchester, Hants and Halifax, Nova Scotia.....	July, 1889-91.
Bruyeres, Capt., R.E....	Report on claim in connection with Saut-Ste.-Marie Canal constructed on Canadian territory prior to 1802, by Messrs. McTavish, Frobisher & Co., on behalf of the "North-West Fur Trading Company".....	Prior to 23rd Dec., 1803.
	This claim was made by Messrs. Forsyth, Richardson & Co., and by Messrs. Parker, Gerrard, O'Gilvy & Co., of Montreal, 15th April, 1802, and by John Mure, of Quebec, 15th April, 1802.	
	Report on progress of new canal at Cascades, to replace the two first canals built, on the same peninsula, between 1779 and 1783.....	16th Jan. 1803.
	See Report Canadian Archives, by Douglas Brynner, Ottawa.....	1886.
	See By, Clarke, Donatti, Finlay, Mann, King and Twiss, herein.....	

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Buchanan, W. O.	Assistant Engineer Welland Canal	1843.
Buck, Walter M.	Provincial Engineer, Province of New Brunswick	Prior to 1881.
	Engineer, Miramichi Section, I. C. R.	do 1876.
Burnett, Thomas.	British Engineer, made survey and plans of Lachine Canal. Superintending Engineer, Lachine Canal Works.	Spring of 1820. 1821-26.
	Canal commenced, 17th July, 1821. do opened in August, 1824. Depth, 4½ feet water on lock sills. Stone locks, 100 by 20 feet	
Burwell	Survey of Goderich Harbour.	1827.
By, Lieut.-Col., R.E. ...	Report on Cascades, Mill Rapids and Split Rock Canals. ... Superintending Engineer of Rideau Canal, Bytown (Ottawa) to Kingston.	24th April, 1805. Sept., 1826.
	Rideau Canal, commenced.	21st Sept., 1826.
	Report on Canadian canals and defences of Canada.	1826.
	do on the Rideau Canal.	6th July, 1827.
	First steamboat "The Pumper" passed through the Rideau Canal	29th May, 1832.
	Rideau Canal completed.	Aug., 1832.
	126½ miles long, with 47 locks of 134 by 33 feet, and 5 feet water on sills of locks. Total ascent from Ottawa to Upper Rideau Lake, 292 feet 3 inches. Total descent from Upper Rideau Lake to King- ston, 165 feet 4 inches. Ottawa River, below Lake Ontario, per Royal Engineers, 126 feet 11 inches.	
	Ottawa River, above the sea, 110 feet. Total cost of Rideau Canal to the British Govern- ment, according to Ordnance documents, in- cluding cost of land and pay of establishment, \$3,911,701.47.	
	The Rideau Canal was under the superintendence of the following Royal Engineers, until it was transferred by the Imperial to the Canadian Government, viz. :— Major Bolton, Lieut.-Col. Thompson, Capt. Charles E. Ford, Lieut.-Col. Chater and Mr. Harvey.	1832 to 1857.
	The management of the Ottawa and Rideau Canals was transferred to the Department of Public Works by an Order in Council.	3rd March, 1857.
	J. S. Killaly, first Superintending Engineer, appointed by Canadian Government.	1857 to 1858.
	J. D. Slater, second Superintending Engineer, appointed by Canadian Government.	Oct., 1858 to Oct., 1872
	F. A. Wise, third Superintending Engineer, appointed by Canadian Government.	Oct. 1872-1891.
Carroll, Cyrus	Engineering Staff, Public Works, harbours, Ontario.	1884-1886.
Cartwright, John S., R.E.	Commissioner with Hon. John Macaulay, Surveyor General of Upper Canada, and Capt. Baddeley, R.E., for ascertaining practicability of a navigable route between the Ottawa and Lake Huron.	1837.
	See Baddeley, Hawkins, Macaulay, Taylor, Thomp- son, according to an Act of the Parliament of Upper Canada, of 4th March, 1837. See App. 30, pp. 837 to 847, by G. F. B., Public Works Report, 1867-82.	
Casey, W. R.	Sub-Engineer on the Germantown and Philadelphia Rail- way and on the New York Crofton Water Works.	Prior to 1834
	Assistant Engineer on the Long Island Railway, N. Y.	do
	do Chamblly Canal	1834.

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Casby, W. R.	Chief Engineer of Railway, St. John to Laprairie, from its commencement to its completion This was the first narrow-gauge railway constructed in Canada; its rails were of flat iron; passenger cars resembled those now used, but shorter and narrower. Made numerous surveys, both as Assistant and Chief Engineer, in various parts of Upper and Lower Canada and several of the United States..... Cedars Canal route proposed on north side of River St. Lawrence. Plan, profile and estimate.....	1834-36. Prior to 1842. 1842.
Chaloner, Charles E.	Public Works, surveys, Manitoba and North-West Territories, &c..... Assistant of R. Steckel, Geodetic survey, River St. Lawrence, between Montreal and Quebec, and River Richelieu, &c., and in Office at Ottawa Member Canadian Society of Civil Engineers.....	1882-83. 1884-91. 24th Feb., 1887.
Champion, A. J.	Engineering Staff, Public Works, Maritime Provinces....	1873-74.
Charbonneau, Maxime....	Engineering Staff, Public Works, Manitoba and North-West Territories, River North Saskatchewan..... Died February, 1887.	1885-86.
Chater, Lieut.-Col.	Royal Engineer, succeeded Capt. Chas. E. Ford, R. E., as Superintending Engineer of Rideau Canal, under Imperial Government.	
Childs, Capt. John.....	Member of Board of Examiners appointed to report on increased accommodation in the Harbour of Montreal and Navigation of the St. Lawrence, &c..... Died February, 1858. <i>See</i> Kirkwood and McAlpine.	9th Nov., 1857.
Cinon, Simon	Engineering Staff, Public Works, harbours, Quebec..... Resigned 11th Aug., 1887. Elected member for Charlevoix for House of Commons, 28th Sept., 1887. Member Canadian Society of Civil Engineers.....	1881-87. 20th Jan., 1887.
Clark, C.	Engineering Staff, New Canal Works, River Trent.....	1882 to 1886.
Clarke, Isaac Winslow....	Deputy Commissary General. Superintendent, Cascades, Split Rock and Côteau du Lac Ordnance canals..... Died 7th July, 1822. For details respecting these works, <i>see</i> Col. Gother, Mann and Lieut. Col. John By, &c., also General Report on Public Works, 1867. These canals were not built under the French, as stated according to tradition at that time.	1809-22.
Clarke, Thomas C.	Ottawa River navigation to Lake Huron, survey..... Report on projected ship canal.....	1859. 2nd Jan., 1860.
Cliff, John	Superintendent Harbour Works, Montreal.....	1832 to 1845.
Cloves, Samuel	Rideau Canal, proposed works..... Welland Canal do Galops, Rapide Plat, Farran's Point and Cornwall Canals, General Report and Estimates submitted.	1823. 1824. 1826.
Cloves, James....	Survey and Report on Welland Canal..... do Rideau do	10th Aug., 1824. Sept., 1824.
Cole, Capt. R. E.	Consulting Engineer, Cornwall Canal construction..... Canal commenced in 1835, opened December, 1842, completed June, 1843.	1833.

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Cole, Major P., R. E....	Report on causes of floods, River St. Lawrence, Montreal.	29th June, 1841.
Conway, John	Engineering Staff, Lachine Canal enlargement	1871-83.
	Assistant Engineer, St. Gabriel Basin, L.C.	1883-86.
	Engineer, electric light apparatus, Lachine Canal, Montreal.	1886-91.
Cornell, J.	Engineering Staff, Public Works, at Montreal, Lachine Canal enlargement.	1843-47.
Coste, Louis.	Engineering Staff, Public Works, Harbours, &c., Prov. Ontario, Quebec and Manitoba	1884-91.
	Acting for Chief Engineer, Public Works, Canada.	1890.
	Member Institution of Civil Engineers, Great Britain.	6th Feb., 1883.
	Member Canadian Society of Civil Engineers.	20th Jan., 1887.
Coutlée, Chas. R. F.	Graduated at Royal Military College, Kingston, Ontario.	June, 1886.
	Engineering Staff, Canadian Pacific Railway.	Oct., 1886, to Feb., 1887.
	Engineering Staff, International Railway, Short Line of C.P.R. from Montreal to Province Line, thence across State of Maine to New Brunswick.	May, 1887, to Oct., 1888.
	Engineering Staff, projected canal, Lake St. Francis to Lake St. Louis.	1st May, 1889-91.
	Student Canadian Society of Civil Engineers.	22nd March, 1888.
Cowley, J. G.	Sub. Assistant Engineer, Beauharnois Canal	1843.
Crawford, William. . .	Survey, Beauharnois Canal, enlargement projected.	1872 to 1876.
	Assistant Engineer, Welland Canal, deepening to 14 feet. .	1st June, 1886, to 1st August, 1887.
	Chief Asst. Resid. Eng. Saut-Ste.-Marie Canal, Canada. .	August, 1887-92.
	First survey made in 1852, by S. Keefer, Chief Engineer of Public Works.	
	Member Canadian Society of Civil Engineers.	20th Jan., 1887.
Crawley, Capt. H. O., R. E.	Reports on Baie Verte Canal project, to unite the Bay of Fundy with the Gulf of St. Lawrence.	19th Jan., 1843, and 14th and 19th Mar., 1843.
Cull, James.	Superintendent Yonge Street Macadamised Road, Toronto.	1836.
	Assistant Engineer, Sarnia and Brantford Roads, &c.	1843.
Cunningham, Granville C.	Resident Engineer, Prince Edward Island Railways, Assistant Engineer in charge of harbours, &c., Prince Edward Island, for Public Works Department.	April, 1875 to 1878.
	Member of Council Canadian Society of Civil Engineers.	1889.
Curran, Veyse.	Assistant Resident Engineer, Southern Division, Welland Canal enlargement	Nov., 1873, to 1st Jan., 1889.
	Asst. Resident Engineer, Saut-Ste.-Marie Canal, Canada. .	1st March, 1889-91.
Cusack, Rheddy.	Late Assistant Engineer to the Right Hon. the Director-General of Inland Navigation, Ireland.	
	Surveys of Ottawa River and Welland Canal.	1824-27.
D'Amours, J. W.	Engineering Staff, Public Works, British Columbia, Victoria, &c. Survey mouth of Fraser River, British Columbia.	1885.
Dawson, Simon J.	River St. Maurice, slides and booms	1852-57.
	Route Lake Superior to Fort Garry, survey commenced. .	1857.
	Work commenced.	1867.
	Col. Wolseley and troops passed	1870.
	Work completed for passage of immigrants.	1871.
	Member of the House of Commons for Algoma	1878-91.

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Deniel, Emile.....	Grenville Canal enlargement..... Panama Canal, Central America..... Chief Assistant of Thos. Monro,—examination of projected canal routes, Lake St. Francis to Lake St. Louis..... Member Canadian Society of Civil Engineers.....	Sept., '72, to Feb. '87. Jan., Feb., March, 1888. 1889-91. 20th Jan., 1887.
Denison, Lieut. W., R.E.	Description of Rideau Canal dams, locks, &c., and of bridges across the River Ottawa.....	1839.
Derome, J. B.....	Piers, &c., Province of Quebec, Public Works Department	10th July, 1864.
Derbshire, Stewart.....	Engineering Staff, employed on harbours and roads.....	1873-77.
Deslarats, G. J.....	Carillon New Canal, slide and dam, River Ottawa..... Ste. Anne Lock, etc..... Headquarters, Depart. of Railways and Canals, Ottawa.....	Aug., 1879-83. 1883-85 Jan., 1885-91.
Ives Brisay, L. P. W....	Engineering Staff, Public Works, Calgary, Bow River bridge	18th March, 1887, to 30th April, 1888.
Desjardins, C.....	On survey ship channel between St. Roch and Ile aux Coudres.....	1881.
Dickinson, John.....	Appointed Commissioner to enquire into cause of floods between Montreal and Quebec.....	4th Oct., 1873.
Dickinson, Jos. E., M.A., Trinity College, Dublin	Assistant Engineer, Northern Division, Welland Canal, 2nd enlargement..... Died in Europe.	15th July, 1874, to 30th Dec., 1879.
Dixon, G. G.	Assistant Engineer St. Lawrence Canals.....	1843.
Donatti, L.....	Deputy Assistant Commissary General, Superintendent, Cascades, Split Rock and Côteau du Lac Ordnance Canals..... For details, see Bruyères, By, Clarke, Mann, Twiss, &c.	July, 1820.
Dore, J. E.....	Engineering staff, canals, &c., P.Q..... St. Zotique road dyke, protection wall on north shore of Lake St. Francis..... Left service.....	1884-86. 1884-85. 1st Jan., 1886.
Douglas, Robert C.	Engineering Staff, Ottawa—canals, &c.....	July, 1872-91.
Drummond, —, R.E....	Superintending Engineer, first Suspension bridge, Ottawa	1826.
Duberger, C. C.....	Assistant Engineer, Public Works, harbour surveys, north shore River St. Lawrence, below Quebec.....	1881.
Ducheneau, A.....	Engineering Staff, Lachine Canal enlargement, &c., Montreal Division..... Superintending Engineer's office, Montreal.....	July, 1872-81. Nov., 1881-91.
Dumais, Horace.....	Harbour surveys, Lake St. John.....	1889-90.
Durnford, Elias Walker, Col., R. E.....	Lt.-Col., 1817-28; Col., 1828. Commanded R. Engineers on Ordnance Canals in Canada Succeeded by Gustavus Nicolls.....	1827-31. July, 1831.
DeVernet, Lieut. Col. Henry.....	Royal Staff Corps, Imperial Government. Capt., 1820; Major, 1827, and Lieut.-Col. General Superintending Engineer, construction of Grenville Canal, &c., under Imperial Government..... Report on Grenville Canal..... Report on Chute à Blondeau and Carillon Canals.....	1833. 1819-29. 20th Nov., 1820. 26th Dec., 1827.

ENGINEERS Employed on Public Works, Canada—Continued.

Engineers.	Works.	Dates of Employment, &c.
DuVernet, Lient. - Col. Henry	Grenville Canal, etc..... Left Canada..... The Grenville, Chute à Blondeau and Carillon Canals, on the north side of the River Ottawa, were designed and constructed by the Royal Staff Corps of Engineers for the Imperial Government. The records respecting these canals were kept in the Ordnance Office at Montreal, and were destroyed by fire in 1852. It appears, however, that the "Grenville Canal" was completed in 1829, the "Chute à Blondeau" in 1832, and the "Carillon" in 1833, and that on the 24th of April, 1834, they were opened, and the steamer "St. Andrew" made the first passage through them. These old canals were 8 miles in length, with 11 locks of 107 to 130½ feet, by 32 to 33 feet and 6 feet depth of water on sills of locks. Cost not ascertained. They were placed under control of Department of Public Works, Canada, 3rd March, 1857. They have since been enlarged, and are now 6½ miles in length, with 7 locks of 200 by 45 feet and 9 feet depth of water on lock sills. The enlargement was commenced in 1871 and completed 27th May, 1882. Cost of enlargement, up to 30th June, 1882, \$975,142.54. Report and estimates, proposed canal and lock at Ste. Anne, north side of River Ottawa, instead of old wooden lock between Ile Perrot and Vaudreuil, built in 1816 by the St. Andrew's Steam Forwarding Company, for steamers of 20 horse power	1827-33. 1834.
Eads, Jas. B., U.S.	Report on Toronto Harbour proposed improvements	14th March, 1882.
Elliot, Geo. Augustus....	Died, 8th March, 1887. Arbitrator Rideau Canal Claims..... Resigned	15th Aug., 1833. 1st Dec., 1834.
Elliot, J. S.	Ordnance Commissioner; negotiated purchase of lands for Rideau Canal prior to.....	1826.
Fafard, Eugène.....	Engineering Staff, Public Works, surveys, P.Q.	1888-90.
Fafard, F. X.	do do do	1881.
Faga, J. M.	do do do Ontario.....	Sept., 1874-80.
Fairbanks, Charles Wm.	Born at Halifax, N.S. Educated at King's College, Windsor, N.S. Entered office of Sir John McNeil, C.E., England..... Projected Halifax Waterworks..... Superintending Engineer—construction Halifax Waterworks..... Halifax waterworks commenced..... Water reached North-West Arm..... do used in the city, summer of	4th Dec., 1821. 1840. 1843. 1845-1848. July, 1845. Nov., 1847. 1848.
	Superintending Engineer—Shubenacadie (Chikabonakady) Canal..... Survey and Report on projected Canal, St. Peters, C.B. Consulting Engineer, waterworks, Charlottetown, P.E.I. Report on Tracadie Harbour to Government of N.S. do projected railways, N.S..... do plans and estimates, waterworks, St. John, N.B. Died at Halifax, N.S.....	1847-1858. 1850-52. 1850. 1851. 5th Nov., 1851. 1851. 11th January, 1885.

ENGINEERS Employed on Public Works, Canada—Continued.

Engineers.	Work.	Dates of Employment, &c.
Fanshaw, Col. R. E....	Commissioner Rideau Canal	1828.
Farijana, F. C.....	Proposed Cedars Canal survey on north shore of River St. Lawrence House Harbour, Magdalen Islands, Gulf of St. Lawrence, Harbours, Ontario, &c..... Died, May, 1882.	1872-73. 1874-75. 1875-81.
Faulkner, William.....	Assistant of C. W. Fairbanks on surveys projected rail- ways, N.S..... Report to Govt. of Nova Scotia on Shubenacadie (Chikabe- nakady) Canal.....	2nd June, 1851. 15th Dec., 1852.
Fellowes, Charles L.....	Served on examination of part of Dawson Route..... Engineering Staff, surveys, &c., Welland Canal, 2nd en- largement	1869. 1870-76.
Finlay, John.....	Assistant Engineer, north division, Welland Canal, 2nd en- largement	1st July, 1876, to 30th May, 1882.
Finlay, John.....	Deputy Assistant Commissary General..... Superintendent Division Rideau Canal..... do St. Lawrence Canals, built by Imp. Govt..... Gives length and number of locks, &c., of the Cascades, Split Rock and Côteau du Lac Canals in a letter dated. See Canadian Archives, under D. Brynmor's cus- tody, at Ottawa, page 121, vol. 47.	1827. 1823 to 1829. 7th June, 1828.
Fleming, Peter	Recommends dredging River Richelieu so as to avoid build- ing lock and dam at St. Ours	1829.
	Dredging of River Richelieu commenced.....	1830-31.
	Consulting Engineer, Williamsburgh and Cornwall Canals.....	1834.
	Engineer employed by Commissioners of Chambly Canal..... These Commissioners were appointed by Act, 3rd Geo. IV, Cap. 41:—Samuel Hatt, W. Macrae, Gabriel Marchand, R. Boileau, Timothée Francoeur, 1829.	
	Survey, plans and estimates submitted to Commissioners.....	1830.
	Probable cost estimated at £54,167 6 0.....	
	This estimate submitted to an officer of the Royal Engineers, who reported thereon at the instance of Sir James Kempt, and estimated the pro- bable cost at £96,745.	
	This last estimate was submitted to Messrs. Hanlon and Hopkins, Civil Engineers, who estimated the probable cost at £60,300.	
	Canal commenced.....	Oct., 1831.
	Canal opened throughout, in the spring of.....	1843.
	Length, 12 miles; 9 locks, 118 to 125 by 23½ to 23½ feet, with 7 feet depth of water on sills; breadth of canal, at bottom, 36 feet, at top, 60. In 1840, the total cost was estimated at \$404,000. The total cost of the works, from their commence- ment to the 30th June, 1867, including im- provements, was \$634,711.76. The original estimate was based on locks 100 by 20 feet, with 5 feet of water on sills of locks.	
Folsom, C. W.....	Engineer in charge of construction, St. Peter's Canal, Cape Breton, N.S.....	1854.
Forbes, W. B., Dep. Com. Gen.....	Superintendent St. Lawrence Canals, built by Imp. Govt. At Cascades, Split Rock, Côteau du Lac, etc.....	1830 to 15 June 1847.
Ford, Capt. Chas. E., R.E.	Superintending Engineer, Grenville Canal.....	1846.
	Succeeded Lieut. Col. Thompson, R.E., as Superintending Engineer of the Rideau Canal, under Imperial Govern- ment. Left Canada	1853

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Forsyth, Robert	Superintending Engineer, Montreal Harbour and Ship Channel Improvement, River St. Lawrence, Montreal to Quebec.	1855 to 1864.
Foulis, Robert.	Report on River St. John, from Fredericton to Grand Falls, New Brunswick.	21st Aug., 1826.
Fraser Cecil	Assistant Engineer, Quebec Harbour Works.	1875-82.
French, J. Barnard.	Welland Canal Staff, north division, 2nd enlargement.	1876.
Frome, Lt. E. G., R.E.	Description of Rideau Canal and Chaudière bridge.	28th Feb., 1837.
Gallwey, W. B.	Preliminary surveys, maps, profiles of projected Chats Canal, between Lake Chaudière and Lake des Chats, River Ottawa, 33 miles above the City of Ottawa. See Report of John Page, Chief Engineer of Public Works, dated Quebec, 30th March, 1854. Work commenced by A. P. McDonald and F. Schram, contractors. Unfinished since work was suspended. Canal 2.83 miles long, designed with 6 locks, of 190 by 45 feet each, with 7 feet of water on the sills and a total lockage of 49.80 feet. Total expenditure, chiefly on rock excavation and preparing stone for locks, \$482,950.81, up to. See page 481, App. 30, by G. F. B., Public Works Report, 1867-82.	1852 to 1854. Aug., 1854. 15th Nov., 1856. 1st July, 1867.
Gamble, F. C.	Assistant Engineer, Public Works, British Columbia. do in charge of Public Works, British Columbia. Member of Canadian Society of Civil Engineers. Resident Engineer and Agent, Public Works Department, British Columbia.	1st May, 1881-86. 1st Jan., 1886-88. 20th Jan., 1887. 1st Jan., 1888-91
Gamble, S.	Report on projected Caughnawaga Canal, between River St. Lawrence and Lake Champlain.	1855-56.
Garon, L.	Assistant Engineer, Public Works, harbour surveys, Ontario	1880-81.
Gaudet, J. F.	Engineering Staff on survey, Dawson Route, from Thunder Bay, Lake Superior, to Fort Garry, Manitoba, 451 miles	1857-59.
Gauvreau, Pierre.	Engineering and Architect staff, Province of Quebec, Public Works Department. Subsequently employed by Provincial Government of Quebec until his decease, on the 16th May, 1884, at the age of 71.	1850-67.
Geddes, —.	Consulting Engineer with Capt. Cole, R.E., and Fleming, Williamsburgh and Cornwall Canals.	1834.
Gibbs, Alexander.	Assistant Superintending Engineer, Lachine Canal.	1823.
Gisborne, F. N.	Superintendent Government Telegraphs, Nova Scotia. Laid Prince Edward Island Cable. Superintendent Government Telegraph and Signal Service, Canada. Laid Gulf of St. Lawrence and Bay of Fundy Cables. Laid British Columbia Cables. Mining Engineer and Electrician, &c. Fellow Royal Society, Canada. Member of Council Canadian Society of Civil Engineers.	1848-51. 1852. 1st May, 1879-91. 1880. 1881-84. 1882. 1888-89.
Gisborne, Hartley.	Government Telegraph Constructing Engineer, British Columbia, &c. District Superintendent Government Telegraphs, North-West Territories. Associate member Canadian Society of Civil Engineers. Located at Fort Qu'Appelle Telegraph Station.	1880-82. 1st Oct., 1882-91. 9th June, 1887. 1889-91.

ENGINEERS Employed on Public Works, Canada—Continued.

Engineers.	Works.	Dates of Employment, &c.
Gordon, Lieut., R.E.	Engineering Staff, Grenville Canal.....	1844.
Gore, T. S.	Assistant Engineer, Sarnia and Brantford Roads, &c.	
Gourlay, Robert	His views respecting Cornwall and Welland proposed canals, and improvement of the River St. Lawrence .. "Statistical Account of Canada," with map, published in London, England..... Died in Edinburgh, Scotland, August, 1863.	1819. 1822.
Gouin, W. F.	Engineering Staff, Public Works, Ontario, Manitoba and North-West Territories.....	1884-91.
Grant, M.	Survey and Report on Navigation, St. John River, N.B.... Commissioner in charge of works, St. John River, N.B....	1850. 1850-51-52.
Gregory, Charles Currie, C.E.	Assistant Engineer, Sarnia Branch Great Western Railway do do European & North-Western—now Intercolonial Railway—Upper Salisbury Division..... Engineer, City of Fredericton, N.B..... European & North American Railway. In charge Eastern Division..... Preliminary location, Carleton Branch Railway..... Chief Eng., for contractors, Prince Edward Island Railway Engineer in charge of alternative surveys North Shore Railway, Quebec..... Chief Engineer Eastern Extension, Nova Scotia..... Arbitrator in case—Canadian Pacific Ry. vs. The Queen...	1857-59. 1859 to 1861. 1862 to 1867. 1867 to 1869. 1870. 1871 to 1875. 1876. 1876 to 1878. 1889-90.
Gray, Henry A.	Assistant Engineer, Intercolonial Railway..... do Public Works Department..... Examination and report, Neebish Rapids channel, Lake Huron..... Engineer in charge of harbours, Western Ontario..... Examination and report, Rideau River flood and proposed outlet by canal..... Assistant to Chief Engineer, Public Works, at Ottawa..... Examination and report on saw-dust obstructions, River Ottawa..... Resident Superintending Engineer, Public Works, Maritime Provinces..... Engineer in charge of harbours, Western Ontario..... Member Canadian Society of Civil Engineers.....	1867-74. 1878-80. 1880. 1881 to 1886. 1886. 1886 to 1888. 11th May, 1888. Aug., 1888-89. 1st July, 1889-91. 20th Jan., 1887.
Greene, D. M.—U.S.	Report on saw-dust in navigable streams.....	10th March, 1871.
Greenwood, H.	Engineering Staff, New Canal Works, River Trent.....	1883 to 1887.
Grondin, A. L.	Engineering Staff, Public Works, harbour surveys, north shore of River St. Lawrence.....	1883.
Guay, J. F.	Mechanical Engineer, Altoona Shops, Pennsylvania Railway, U.S..... Assistant Engineer, North Shore Railway, Quebec to Montreal..... Engineer in charge of location and construction of Quebec and Lake St. John Railway..... Survey of projected railway from St. Alphonse, Baie des Ha! Ha!, River Saguenay, to Lake St. John..... Survey and plans for water works at Fraserville, Rivière du Loup..... Survey and plans for water works at Chicoutimi, River Saguenay..... Engineer in charge of construction, Montmorency and Charlevoix Railway, Quebec to Ste. Anne de Beaupré Engineer in charge of surveys for projected works, Lake St. John, Upper Ottawa, &c..... Associate Member Canadian Society of Civil Engineers...	1873 to 1878. 1878-79. 1880-87. 1882. 1885. 1887. 1887 to July, 1889. 1889-91. 25th June, 1887.

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Guerin, Thomas.....	Engineering Staff, Head-quarters, Public Works..... Previously Professor Civil Engineering at McGill University, Montreal. Assistant Engineer of G. F. Baillairgé on Baie Verte Canal survey..... Hydraulic surveys, Montreal, Ottawa, Chaudière Falls and Manitoba, &c..... Member Canadian Society of Civil Engineers..... Died suddenly in his office at Ottawa, 7th May, 1887.	1st Sept., 1864-69. 1870 to 1873. 1883-87. 20th Jan., 1887.
Guy, A.	Sub-Assistant Engineer, Beauharnois Canal	1843.
Gzowski, Col. C. S.	Graduate of Engineering Military School of Krzemieniec, Russia. Engineer on the Pennsylvanian Canals, Lake Erie division, and on the construction of a portion of the New York and Erie Railway, terminating at Dunkirk, Lake Erie, U.S..... Superintending Engineer, roads, harbours, &c., Western Ontario..... Report on Burlington Bay Canal..... Chief Engineer, St. Lawrence and Atlantic Railway..... Consulting Engineer do do do do do do harbour and works, at Montreal..... do do ship channel improvement between Montreal and Quebec..... Canal Commission, projected enlargement, &c..... International Bridge across the Niagara..... Report on proposed enlargement Welland Canal..... do do scheme Baie Verte Canal..... Third President Canadian Society of Civil Engineers..... Member of Royal Commission to examine and report on plans Montreal harbour improvements.....	1837 to 1841. 1841 to 1847. 16th Feb., 1848. 1848 to 1852. do do do 1850 to 1853. 1850 to 1853. 16th Nov., '70 to '71. 1871 to 1872. 14th Feb., 1873. 18th do 1873. 1889-90. 10th April, 1890.
Hadden, Lieut., R.E.	Engineering Staff, Grenville Canal.....	1834.
Hale, W. D.	Specification for extension of piers at Port Stanley, Lake Erie.....	2nd Nov., 1849.
Hall, Major, Royal Staff Corps.....	Engineering Staff, Carillon Canal.....	1832.
Hall, Francis Benj.	Assistant Engineer, with Mr. Telford, construction of Tweed Bridge, Rockliff, G.B. Assistant Engineer, calculations, designs and execution, Menai Bridge, Anglesea, Great Britain. Designed suspension bridge at Newcombe, across the Morsey, Great Britain. Welland Canal route, with Messrs. Clowes and Roberts..... Shubenacadie (Chibabenaikady) Canal, N.S., commenced..... See App. 30, p. 402, by G. F. B., Public Works Report, 1867-82, and Public Works, Canada, and their Engineers,—Canals—1779-1891. Superintendent construction, Burlington Bay Canal..... Report on Baie Verte Canal project..... Report on proposed St. Peter's Canal, Cape Breton, N.S..... Proposed suspension bridge across Niagara River..... Roads, Ontario..... NOTE—Welland Canal commenced 30th November, 1824. Opened 30th November, 1829, for vessels drawing 7½ feet of water, and of 21½ feet beam. Wooden locks, 110 by 22 feet.	1824. 25th July, 1826. 1825 to 1832. 1825. 1826. March, 1836. July, 1845.
Hamel, Amédée.....	Engineering Staff, Culbute Canal..... Assistant Engineer, Canadian Pacific Railway survey..... do do River St. Louis improvement..... Head-quarters, Railways and Canals.....	1874. 1879. 1880. 1880-91.

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Hamel, Felix M.	Engineering Staff, Public Works, harbours, &c.	1st March, 1867, to 1st Sept., 1868.
	do Intercolonial Railway, until	1st Sept., 1870.
	do Public Works, at Head-quarters, until	10th June, 1871.
	do Canadian Pacific Railway do	January, 1874.
	do Culbute Canal, River Ottawa do	August, 1874.
	Eng. in charge. Lock, &c., Rivière du Lièvre and Iron Bridge, Chaudière Falls	1887-91.
	Member Canadian Society of Civil Engineers.	20th Jan., 1887.
Hanlon,	This Engineer and W. R. Hopkins, "Persons possessing much professional talent," were consulted by Chamblay Canal Commissioners respecting the estimate of Peter Fleming, £54,167 6s., which they increased to £60,300, for the construction of this canal, with locks of 100 by 20 feet, with 5 feet water on sills.	1830-31.
	Canal commenced.	Oct., 1831.
	Canal opened to navigation with locks 118 to 125 x 23½ feet with 7 feet water on the sills.	17th Nov., 1843.
Harrington, Thos. W.	Engineering Staff, St. Lawrence and Ottawa Canals	19th July, 1870.
	Assistant Engineer, Lachine, Chambly, Culbute Canals.	1st October, 1870.
	Assistant Superintending Engineer, Canals, Province of Quebec.	1st May, 1875-87.
	Member Canadian Society of Civil Engineers.	20th Jan., 1887.
	Died 26th October, 1887.	
Harris, Major, Chs., R.E.	Rideau Canal, Report and Estimate jointly made with Col. J. C. Smith and Sir George Hoste.	1825.
	Locks to be 108 x 20 x 5 feet water on sills. (Afterwards built 133 x 33 x 5 on sills.) Work commenced in 1826, and completed 29th May, 1832, under Lieut.-Col. By, R.E.	
Harris, John.	Master Royal Navy. Survey and Estimate, Burlington Bay Canal.	1825 to Oct., 1827.
	Superintending Engineer, Burlington Bay Canal.	1827.
Harvey, Charles, R.E.	The last of the Superintending Engineers of the Rideau Canal, under the Imperial Government, until the canal was transferred to the Department of Public Works of Canada by Order in Council.	3rd March, 1857.
	See "Lieut.-Col. By" for his predecessors.	
Hawkins, William	Survey with David Taylor and David Thompson, of canal route Lake Huron to Ottawa River.	1837.
	See Baddeley, Cartwright, Clarke, Walter Shanly, James Stewart, David Taylor, David Thompson, and App. 30, p. 837 to 847, by G. F. B., in General Report Public Works, 1867-82.	
Haycock, Sam. H.	Engineering Staff, Galops Canal enlargement.	August, 1879.
Hayes, Capt., Royal Staff Corps	Engineering Staff, Grenville Canal.	1834.
Hayne, Capt. R.	Royal Staff Corps. Superintending Engineer, Carillon Canal.	1832.
	Superintendent, construction of Ottawa River Canals.	1833-34.
Hazlewood, Samuel.	District Engineer on Intercolonial and Canadian Pacific Railways. In charge of Fort Frances Canal works, at foot of Rainy Lake.	1875.
	See Baillairgé, Mortimer, Sutherland, H. Thompson.	
Heckman, J. W.	Engineering Staff, Public Works, river improvements.	1886.
	Member Canadian Society of Civil Engineers.	24th Feb., 1887.

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Hegan, J. B.	Assistant Engineer, Intercolonial Railway. Assistant Engineer, Public Works, Maritime Provinces. Acting Engineer in charge of Public Works do Member Canadian Society of Civil Engineers Resident Engineer at St. John, Public Works, N.B.	1869 to 1873. 1873 to 1880. 1882 to Sept., 1883. Sept., '83 to July, '88. 17th May, 1888. July, 1889-91.
Henry George W.	Lachine Canal enlargement, Lachine Division. Left service July, 1885, for C.P.R.	July, 1880-85.
Henshaw, George H.	Resident Engineer, new lock and channel Ste. Anne de Bellevue, River Ottawa, north side. Paper on floods of River St. Lawrence. Paper on frazil ice, its nature and prevention, to the Cana- dian Society of Civil Engineers. Member Canadian Society of Civil Engineers.	October, 1873-83. 1884. 1887. 22nd March, 1888.
Heyland, A. R.	Engineering Staff, Public Works, British Columbia.	1st Oct., 1885, to 19th Nov., 1888.
Hill, A. E. B.	Engineering Staff, Public Works, British Columbia. Bachelor of Applied Sciences, member Canadian Society of Civil Engineers.	1st Oct., 1887-89. 25th June, 1887.
Hopkins, W. R.	Resident Engineer, Chambly Canal. Chambly Canal commenced. Locks 118 to 125 \times 234, with 7 feet of water on sills. Chambly Canal open to navigation. St. Ours Lock and Dam proposed.	1831-34. Oct., 1831. 17th Nov., 1843. 1835.
Hoste, Lieut.-Col. Sir Geo., R.E.	Rideau Canal, report and estimates. Locks to be 108 \times 20 and 5 feet depth on sills. (Altered to 133 \times 33 \times 5) Work commenced 1826, and completed 29th May, 1832, under Lieut. Col. By, R.E.	1825.
Holloway, Col. Wm. Cuth- bert Elphington, C. B. Commander R.E.	Survey and report on navigation of Richelieu, St. Law- rence and Ottawa Rivers. Report on Welland Canal. Testimony re Rideau Canal lands.	1845. June, 1845. 4th June, 1845. 15th March, 1845.
Hounslow, T.; F. W., R.E.D.	Description of method of raising buildings by screws in Canada and the United States.	18th Sept., 1841.
Howorth, Lieut., R.E.	Engineering Staff, Grenville Canal.	1836.
Hughes, J.	Report on proposed arbitration, St. Lawrence Canals.	31st Oct., 1834.
Hunter, William.	Resident Engineer, Lake St. Peter.	15th Feb., 1843, to 10th Dec., 1844.
Inglis, William.	Consulting Engineer, Richelieu Nav. Co., &c. Born at Ottawa, Ont. Died at Bolton, England.	1836. 22nd April, 1890.
Irving, J. L.	Assistant Engineer to H. A. Gray, Western Ontario.	26th May, 1884-88.
James, C.	On southern division, Welland Canal, 2nd enlargement.	1875.
Jackson, John.	Report, &c., for Grand River (Ottawa) Navigation Co.	1st Nov., 1843.
Jervis, J. B.	Report on projected Caughnawaga Canal from River St. Lawrence to Lake Champlain, and from Caughnawaga to St. John, recommending its construction, as pro- posed by J. B. Mills, 19th February, 1848.	13th Feb., 1855.
Jebb, Capt., R.E.	Routes for Rideau Canal proposed between Ottawa and Kingston.	1815 to 1817.

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Jonah, Frank G.	Engineer in charge of soundings and borings for subway, from Prince Edward Island to mainland at Cape Tormentine.	1885.
Joslin, H. K.	Lachine Canal, 2nd enlargement, Res. Eng., Montreal Div. Left service 1st May, 1882. Died in Nov., 1887.	July, 1872-82.
Keating, E. H.	City Engineer, and Engineer and Superintendent water works, Halifax, N.S. Engineering Staff Pictou Ry. Chief Draughtsman, Windsor and Annapolis Railway Asst. Engineer, Intercolonial Railway. Div. Engineer, Can. Pac. Ry. explorations. Member of the Institution of Civil Engineers, London. Engineer for various water and sewerage works. Resident Chief Engineer, Halifax Graving Dock. Constructed by Halifax Dry Dock Company, incorporated in England. Agreement with Public Works Depart., Canada, signed... Length, 585 feet; width, at coping level, 102 feet; width on bottom, 72 feet; width of entrance, 894 feet; depth on sill, ordinary spring tides, 30 feet— (spring tides rise 6 feet; neap tides, 3 feet). Work commenced. Opened for use by Vice-Admiral Watson, Commander-in-Chief North American and West India Station, H.M.S. "Canada" docked. Subsidy by Dominion Government, Imperial Government, and City of Halifax, each \$10,000 per annum, for 20 years. Contractors—Messrs. Pearson, Son & Brookfield. Local Contractor, Samuel M. Brookfield. Cost, about \$1,000,000. Approved by H. F. Perley, Chief Engineer, Public Works Department.	— to 1891. 1864-67. 1867. 1868-1872. 1872. 1878. 1886-1891. 13th Feb., 1886. 1st May, 1886. 20th Sept., 1889. 21st Sept., 1889.
Keefer, George.	Engineer, Welland Canal Co. Res. Eng., first construction of lower div. of Cornwall Canal Resident Engineer in charge of Chambly Canal, completion and improvements. Member of Council, Canadian Society of Civil Engineers.	1833. 1834-43. 1844-47. 1889.
Keefer, Samuel H.	Secretary and Asst. Engineer, Public Works, Upper Canada Chief Engineer, Public Works, Ontario and Quebec. Superintending Engineer, Welland Canal. Survey Saut-Ste-Marie projected canal, Canada. Chief Superintending Engineer, Grand Trunk Railway. Inspector of railways. Assistant Commissioner of Public Works. Canal Commission Report on proposed Welland Canal enlargement. do Baie Verte Canal route, &c. Second Past-President Canadian Society of Civil Engineers Born at Thorold, 22nd Jan., 1811. Died at Brockville, 7th Jan., 1890.	28th March, 1833-41. 17th Aug., 1841-52. 24th June, 1846. 1852. 1853 to 1859. 1857-64. 6th May, 1859-64. 16th Nov., 1870-71. 14th Feb., 1873. 18th Feb., 1873. 1888.
Keefer, Thos. C.	Assistant Engineer, Welland Canal. River Ottawa slides and booms. River St. Lawrence improvements. Survey and design for Victoria Bridge. Consulting Engineer, Ship Channel and Montreal Harbour Hamilton Water Works. Georgian Bay Canal project, report. Chief, Executive Committee of Canada at Paris Exhibition Montreal Water Works, &c. First Past-President Canadian Society of Civil Engineers. President American Society of Civil Engineers Montreal Flood Commission.	1842-45. 1846 to 1849. 1849 to 1851. 1851-52. 1853 to 1855. 1857-59. 1863. 1878. 1878 to 1887. 24th June, 1887. 1888. 1886-88

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Keeley, D. H.	Assistant Superintendent Government Telegraph Lines of Canada.....	1st March, 1882-91.
	Associate Member of Canadian Society of Civil Engineers.....	25th June, 1887.
	Patent for multiplex system of telegraphing.....	1890.
Keller, Capt. L.	Engineering Staff, Public Works, hydrographic survey, Pointe-aux-Trembles to Cap Charles, River St. Lawrence, &c.	1882-84.
Kelly, Athol D.	Engineering Staff, Welland Canal enlargement, North Division.....	1875.
Kennedy, John.....	Chief Engineer, harbour improvements, Montreal, and dredging of River St. Lawrence, Montreal to Quebec.....	20th April, 1875-91.
	Vice-President Canadian Society of Civil Engineers.....	24th June, 1887.
	Montreal Flood Commission.....	1886-88.
	Vice-President, Canadian Society of Civil Engineers.....	1890.
Kerr, Robert W.	Report on macadamized road, Dundee to Guelph, Ont.	23rd March, 1839.
Ketchum, H. G. C.	Superintending Engineer, construction of Ship Railway Bay of Fundy, to Baie Verte, Gulf of St. Lawrence....	1887-91.
	Member Council Can. Soc. of Civil Engineers.....	16th Oct., 1887.
Kierkowski, A.	Engineering Staff, Beauharnois Canal.....	1842 to 1845.
	Died towards 1871.	
Killaly, John S.	Educated in Europe for the civil and mining branches of the profession; chose the North American States as a field of operation. He was subsequently engaged in Canada, upon the construction of the Cornwall Canal, which was commenced in 1834 and completed in 1843. Enlargement with locks, 270 x 45 x 14 feet water on lock sills; commenced 1876, unfinished 1890. Superintending Engineer of the Rideau Canal.....	Jan., '57, to April, '58.
	He was the first Superintending Engineer appointed on this work by the Government of Canada; all previous engineers thereon having been appointed by the Imperial Government. (<i>See</i> Lieut.-Col. By, R.E.).....	1832 to 1857.
	Returned to the United States where he has been engaged on various works, chiefly, of late years, upon the canals of the State of New York.....	1858-89.
	Resides at Booneville, Oneida County, N.Y.	Dec., 1889.
	Brother of Hon. H. H. Killaly, chairman of the Board of Works, Canada, 29th Dec., 1841, to 8th June, 1846.	
Killaly, Hon. H. H.	Entered Trinity College, Dublin, in 1815; graduated there in 1819, when he commenced the practice of civil engineering, superintending the construction of the Custom House at that city. Was afterwards associated with his father until the death of the latter in 1832, and was engaged in the construction of roads, bridges, canals, and the improvement of the River Shannon, &c., most of which works being situated in the western part of Ireland. His father was, for many years, Government Engineer for the Board of Works of Ireland, under Gen. Sir Geo. Burgoyne, R.E. Resigned his position in Ireland and came to Canada where he settled near New London, Ont.	1834.
	Survey with N. H. Baird for first enlargement of Welland Canal.....	1837.
	Chairman Board of Works, Ontario and Quebec.....	29th Dec., 1841, 8th June, 1846.
	Specification of works at Windsor Harbour, Lake Ontario. Special reports on Saint-Ste-Marie, Goderich Harbour, piers below Quebec, Lake St. Peter, Pointe Pelée lighthouse, &c.	1st May, 1843.
	Assistant Commissioner of Public Works.....	1846 to 1862.
	Died 28th March, 1874, aged 72.	15 Feb., 1851.

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Killaly, H. H., jun.	Resident Engineer, upper division of Lachine Canal, 2nd enlargement	Feb., 1876-85.
	Cornwall Canal enlargement, upper half	1st July, 1885-91.
	Rapide Plat Canal, &c., enlargement, &c.	Dec., 1884-88.
	Member Canadian Society of Civil Engineers	20th Jan., 1887.
King, Chetwood Henry Waters	Engineering Staff, southern division, Welland Canal enlargement	Feb., '83 to Nov., '88.
	A physician, practising at Cohoes, N.Y., U.S.A.	1890.
King, William	Assistant Mechanical Engineer, Ottawa, &c.	26th Dec., 1878-91.
	Public buildings and dredges.	
King, Capt. William	Royal Staff Corps, Grenville Canal	1825.
	Superintending Engineer, Cascades, Split Rock, Côteau du Lac—Ordinance Canals	1826.
	See By, Mann, &c.	
Kingsford, William, C.E., L.L.D.	Survey, map and description Lachine Canal	1847.
	Engineer in charge of preliminary surveys, G. T. Railway, Cornwall to Dickinson's Landing, Brockville, and Lynn, Farmerville, Lyndard, and flats of Rideau Canal, to Kingston; permanently located line from Montreal to Cornwall	1852-54.
	Author and publisher of a work entitled "The Canadian Canals, their History and Cost," with arguments recommending their enlargement	1864-65.
	Special examination, with confidential report, on Champlain Canal, in the State of New York, in connection with projected Coughnawaga and Champlain Canal, establishing, that propellers of large size, leaving the St. Lawrence and reaching Lake Champlain, could not find any exit	1871.
	Examination, report, designs and estimate of the cost of making River Gananoque navigable	1872.
	Prepared map of Rideau Canal, from Ottawa to Kingston, showing area of water sheds, &c.	1872.
	Engineer in charge of harbour and river improvements, breakwaters and piers, in the Provinces of Ontario and Quebec, from Lake Superior to the Gulf of St. Lawrence; commenced removal of Rock Shoal, Kingston Harbour; designated and partly completed new channel through Neebish Rapids; examination and report, with estimate on causes of inundation, Chenal du Moine, &c.; report on harbours of refuge, Lower St. Lawrence; designed improvements and constructed breakwater, Collingwood Harbour; designed improvements, Penetanguishene waters, and entrance to River Kamanistiquia, etc.	1873-80.
	Survey and Report on the condition of Toronto Harbour, also on waters of Sarina and Oakville	1873-80.
	Report, estimates and drawings of proposed tunnel under Detroit River, from Amherstburgh to United States shore	1873-80.
	Directed several important surveys, making reports, maps and estimates	1873-80.
	Prepared Annual Report, Department of Public Works, several years prior to	1880.
	Connection with Department of Public Works ceased, 1st March, 1880, when H. F. Porley was recalled to headquarters, and was assigned to the duty of Engineer of this Department.	
	A gratuity equal to 6 months' salary (\$1,650) voted by Parliament in 1881, as compensation for loss of employment, and paid to Mr. Kingsford.	
	Member Canadian Society of Civil Engineers	20th Jan., 1887.
Kinipple & Morris	Members' Institution of Civil Engineers, Great Britain.	

ENGINEERS Employed on Public Works, Canada—Continued.

Engineers.	Works.	Dates of Employment, &c.
Kinipple & Morris	<p>Engineers—Docks at entrance of River St. Charles, Quebec Works authorized by Act 36 Vic., chap. 32, sec. 17</p> <p>Princess Louise embankment and quay wall on north side of 1st projected series of docks, 3,960 feet long and 330 wide. Outer or tidal basin, 20 acres in area, and 29 feet deep at low water of ordinary spring tides. Inner basin, 36 acres in area, and 25 feet deep at high water lowest neap tides. Spring tides rise 18 and neaps 13 feet. Work commenced under Harbour Commissioners, Quebec</p> <p>Quay wall and outer basin, nearly completed</p> <p>Cross-wall between inner and outer basins, commenced in 1883, under H. F. Perley, Chief Engineer, Public Works, and completed with gates, etc., and south wall, along St. Andrew's Street. For Contractor's, etc., see page 88.</p> <p>Expenditure on construction, \$3,874,400, to</p> <p>Engineers—Lévis Graving Dock, opposite Quebec</p> <p>Length, 495 feet, with a circular head of 31 feet radius, and a square offset of 19 feet on each side. Width at coping level 100, and at bottom 73 feet. Entrance width, 62 feet. Depth of water on sill at high water of ordinary spring tides, 25½ feet, and at low water, 7½ feet Depth of water on sill at high water of ordinary neap tides, 23 feet, and at low water, 10 feet</p> <p>Work authorized by Act 38 Vic., chap. 56</p> <p>Site chosen by an Order in Council</p> <p>Work commenced under Harbour Commissioners, Quebec</p> <p>Work continued and completed under H. F. Perley, Chief Engineer, Public Works.</p> <p>For Contractor's, etc., see page 87.</p> <p>Expenditure on construction, \$912,194.90 up to</p> <p>Engineers—Esquimalt Graving Dock, about 3 miles below Victoria, Vancouver Island, B.C. Plans and specifications prepared and on exhibition at Victoria, &c., by Provincial Government of British Columbia</p> <p>Plans of the caisson furnished by them</p> <p>Act of Provincial Government, B.C., authorizing construction of graving dock, 43 Vic., chap. 8.</p> <p>Agreement between Dominion Government and Government of British Columbia, under sanction of Imperial Government, respecting construction of graving dock, signed subsequently to Contract awarded to McNamee & Nish by Government of British Columbia</p> <p>This contract was cancelled by Government of British Columbia</p> <p>Work continued by day's labour</p> <p>Hon. J. W. Trutch appointed Engineer in charge and W. Bennett, as Resident Engineer</p> <p>Work under Dominion Government authorized by Act 47 Vic., chap. 6</p> <p>The graving dock and its grounds to be transferred to Dominion Government in virtue of this Act</p> <p>Work continued and completed under H. F. Perley, Chief Engineer, Public Works</p> <p>Contract for completion of graving dock signed by Larkin, Murphy & Comolly, \$581,841.43</p>	<p>1875-82. 1873.</p> <p>28th May, 1877. Dec., 1882.</p> <p>1889.</p> <p>30th June, 1890.</p> <p>1875-82.</p> <p>1875. May, 1877.</p> <p>1878.</p> <p>Sept., 1883-89.</p> <p>30th June, 1890.</p> <p>18th Nov., 1879.</p> <p>1st Dec., 1882.</p> <p>1880.</p> <p>12th July, 1880.</p> <p>1880.</p> <p>1882. 1882-83.</p> <p>24th Nov., 1883.</p> <p>1884.</p> <p>1884-87.</p> <p>8th Nov., 1884</p>

ENGINEERS Employed on Public Works, Canada—Continued.

Engineers.	Works.	Dates of Employment, &c.
Kinipple & Morris.....	Contract for caisson, "Dominion Bridge Co.," Montreal, \$53,729.54, to..... Dock completed and opened by entrance of H.M.S. "Cormorant"..... Expenditure—Provincial Government, British Columbia.....\$384,512 66 do Imperial Government 243,333 33 do Dominion do 529,214 42 Total \$1,157,060 41 up to Dimensions of graving dock as completed up to... Length at centre.....430 feet Width at bottom.....41 " do coping level.....90 " do entrance.....65 " Depth of water on sill, 26½ feet at high water springs. Springs rise 7 to 10 feet, per Capt. Richards. R.N. Neaps rise 5 to 8 "	10th July, 1885. July, 1887. 17th Dec., 1889. 1890.
Kirkwood, James P....	Member of Board of Engineers, appointed to report on Montreal Harbour and Navigation, &c., of the River St. Lawrence..... Report on Montreal Harbour and Navigation, &c., of the River St. Lawrence.....	9th Nov., 1857. 24th March, 1858.
Kuper, Augustus	Prepared plans and specifications for improvements Riche- lieu River.....	1831.
Lafleur, Eugène D.....	Engineering Staff, Public Works at Ottawa..... Assistant Engineer, hydrographic survey, River St. Law- rence..... Harbour works, Ontario, Quebec and New Brunswick..... Member Canadian Society of Civil Engineers.....	27th Sept., 1881. July, 1883-84. 1884-91. 20th Jan., 1887.
Langevin, H. Laforce...	Princess Louise Basins, Quebec, and Point Lévis Graving Dock..... Assistant Engineer, harbour works, Quebec and Lévis..... Associate member Canadian Society of Civil Engineers.....	1884-88. 1889-91. 27th June, 1888.
Languedoc, G. de G....	Grenville Canal enlargement..... Associate member Canadian Society of Civil Engineers.....	May, 1879 to 1887. 24th Feb., 1887.
Lantier, E.....	Engineering Staff, survey proposed Cedars Canal	1872-73.
Lapham	Member Canadian Society Civil Engineers.....	14th Oct., 1889.
Lapham	Assistant Engineer, Welland Canal Co.....	Aug., 1827.
Laroque, A. B.	Junior Sub-Assistant Engineer, Beauharnois Canal.....	1843.
Larue, Adolphe.....	Provincial Land Surveyor, P.Q., Survey of Lake St. Louis. Assistant of H. G. Thompson..... Report on claims for damages, Beauharnois Canal.....	1836. 1836. 9th Feb., 1856.
Laurie, James	Report and estimates, St. Peter's Canal, Cape Breton, N.S.	July, 1858.
Lawson, W.	Assistant Engineer, Sarnia and Brantford Roads.....	1843.
Lefebvre, Jean.....	Engineering Staff, Metapedia Road, S. Division, assistant to G. F. Baillairgé	1857 to 1867.
Legge, Charles	Engineering Staff at Head-quarters, Montreal, and on weirs, &c., of canals below Prescott..... Afterwards on railway service, &c. Died.....	1846 to 1854.
Lepage, J. B.....	Engineering Staff, Public Works, harbour surveys and river improvements, occasionally	1880-90.
	Previously in charge of Colonization roads since 1857.	

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Lepage, Samuel	Engineering Staff, Public Works, harbour surveys below Quebec.....	1883.
Leprohon, C. de B.	Engineering Staff, Lachine Canal enlargement, Lachine Division..... Left service July, 1885, for Corporation, Montreal.	Oct., 1875-85.
Leslie, William Lewis ..	Engineering Staff, S. Division, Welland Canal enlargement do do Head-quarters, Ottawa.....	Oct., 1872, Nov. 30, '88 Feb., 1889-91.
Lewis, Col., R. E.	Commissioner, Rideau Canal.....	Spring, 1828.
Light, Alex. L.	Assistant Engineer on western roads, Ontario, under Col. C. S. Gzowski	1842 to 1848.
Lightfoot, F. C.	Engineering Staff, surveys of harbours and rivers..... Employed in Chief Engineer's Office.....	July, 1874-77. 1877-91.
Lindsay, John	Engineer—Survey head-waters, River Ottawa. Died 28th Sept., 1880, at Mattawa.	15th June, 1880.
Long, Major Andrews...	Royal Staff Corps of Engineers, Imperial Government. Construction and repairs, Cascades, Split Rock and Côteau du Lac—military canals..... <i>See By, Mann, &c.</i>	1817.
Lyons, James.....	Superintending Engineer, River Trent Works—improvements; light-houses, River St. Lawrence, &c.....	1843-55.
Macdonald, J. Frobisher	Cornwall Canal, &c..... Superintending Engineers, canals, Lachine, Chambly, St. Ours, &c..... Piers below Quebec..... River St. Maurice, slides and booms..... Témiscouata Road, commenced 1856, opened 1861, completed 1866, under Joseph Rosa his assistant..... Died at Toronto in the autumn of 1857.	1842-43. 1848-52. 1849-50. 1851-52. 1853.
Macdougall, Alan.....	Engineering Staff, Public Works, harbours, &c., Ontario.. Member Canadian Society of Civil Engineers.....	Sept., 1873. 20th Jan., 1887.
Maillefert	Submarine Engineer, examined River St. Lawrence Rapids from Lake Ontario to foot of Lake St. Louis at Lachine.....	1854.
Maine, Charles.....	Engineering Staff, Harbour of Three Rivers, River St. Maurice slides, dams and booms, River Yamaska, Nicolet, &c..... Previously on Public Works in France, &c.	1886-91.
Maingy, Robert	Mining and Civil Engineer, Superintending Engineer, Hamilton and Brantford Road.....	1837.
Mann, Col. Gother	Royal Engineer Corps, Imperial Government. Letter to Messrs. Forsyth, Richardson & Co., opponents to McTavish, Frobisher & Co., respecting Saut-Ste.-Marie Canal, prior to..... Saut-Ste.-Marie Canal, on Canadian territory, 3,000 feet long, with a lock, raising the water 9 feet, between Lakes Huron and Superior; survey made by order of the firm of Messrs. McTavish, Frobisher & Co., on behalf of the North-West Company..... Canal constructed by them, prior to..... <i>See Capt. Bruyères, Royal Engineer.</i> Report on the state of the first canals built between 1779 and 1783, at the Cascades and Mill Rapid, Split Rock, "Trou du Moulin" at Longueuil's Mill and at Côteau du Lac, recommending their enlargement.....	18th April, 1803. 1797. April, 1802. 24th Dec., 1800.

ENGINEERS Employed on Public Works, Canada—Continued.

Engineers.	Works.	Dates of Employment, &c.
Mann, Col. Gother	<p>He recommended to enlarge the original locks, which were 7 feet wide at Côteau du Lac, and 6 feet at Split Rock, to 9½ feet, between the gates, to increase the depth of water 1½ feet in the canals and on the lock sills, then about 2 feet, to 3½ feet, to widen the lock chambers 4 feet and the canals 2 feet.</p> <p>At Mill Rapid and Cascades, at Cascades Point, he recommended the construction of one instead of two canals, and to sink the bottom at each entrance thereof to a depth of 3 feet below the lowest water for the passage of the largest boats. Canal to be 10 feet wide, with 3 locks 20 feet wide in the chamber and 120 feet long, so as to allow the passage of 6 boats at a time.</p> <p>Frederick Haldimand, Lieut. Governor of Canada, 1778-1785, wrote to Lord Geo. Germain that a very complete canal was completed and in operation at Côteau du Lac. See letter in Canadian Archives, at Ottawa, D. Brymner, Archivist, dated</p> <p>The locks at "Split Rock" and "Côteau du Lac" were partly rebuilt and a new canal, about half a mile in length, with 3 locks and a total rise of 13½ feet was built at the Cascades.</p> <p>All the locks were probably then enlarged to 9½ feet between the gates, as suggested by him.</p> <p>The locks of the Cascades, Split Rock and Côteau du Lac Canals were enlarged by the Royal Staff Corps, to 12 feet between the gates, and the depth of water on the lock sills was increased to 3½ feet, for the passage of Durham boats, with from 80 to 100 barrels of flour, instead of the former boats with 30 to 40 barrels.</p> <p>From 1815 to 1834, both years inclusive, the gross revenue on these canals was £31,580 13 4; the cost of repairs, &c., £10,102 15 2½, and the net revenue, £21,470 17 1½.</p> <p>Report on navigation of St. Lawrence at Longueuil Mill "Tron du Moulin" and between that point and Cedars.</p> <p>Consulting Engineer of Grenville Canal which was commenced in summer of</p> <p>G. F. Baillairge, the present Deputy Minister of Public Works, made surveys and plans of the canals at the Cascades, Split Rock and Côteau du Lac, the locks and gates of which were then entire; the width between the gates of the locks was 12 feet, and the depth of water on the sills from 3 to 4 feet.</p> <p>He also measured one of the canals built between 1779 and 1783, on Cascades Point, which had been used as a flume for a mill then in ruins; the width between the lock gates was 6 feet.</p> <p>From 1857 to 1890, the masonry of the locks, &c., at the Cascades and Split Rock, has been partly demolished by persons in want of cut stone for building purposes.</p> <p>At Côteau du Lac, the old canal has been used most of the time up to 1881 as a flume for a mill erected thereon by George Beaudet, the lessee.</p> <p>For further details, see General Report of Public Works, 1897; also, Report on Canadian Archives, 1886, by Douglas Brymner, Archivist.</p> <p>These canals were not previously constructed by the French, as was believed in 1867.</p>	<p>25th Oct., 1780.</p> <p>1804.</p> <p>1817.</p> <p>1815 to 1834.</p> <p>25th Sept., 1818</p> <p>1819.</p> <p>1857.</p> <p>1st June, 1871, to 1st Feb., 1881.</p>

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
McTaggart, John, R.E.	Clerk of Works, Rideau Canal Examination and report on Rideau Canal. Survey and report on Burlington Bay Canal.....	1826. 1827-28. 30th Mar., 1827.
Melhuish, Capt., R.E.	Account of demolition of Glacière Bastion, Quebec..... Consulting Engineer, Chambly Canal	1828. 1831.
Merrill, Horace.....	Superintending Engineer, Ottawa River slides and booms. St. Maurice slides at Shawenegan and Grand Mère, first designed by him and laid out by G. F. Baillargé..... Carillon dam across the River Ottawa	20th Jan., 1849, to 22nd July, 1875. 1852. June, 1879, to 1883. Died 22nd May, 1883.
Merritt, Thomas.....	Engineering Staff, Welland Canal enlargement, Northern Division	1875.
Michaud, C. E.	Assistant Engineer of G. F. Baillargé on survey of Gaspé and Ste. Anne des Monts road, north shore, Gulf of St. Lawrence..... Engineering Staff, Public Works, harbour works, &c. On Pacific Railway survey, British Columbia..... Resident Engineer, lock and dam, River Yamaska, Rivers St. Francis and Nicolet, dredging and improvement... Resident Engineer, harbour works, south shore, River St. Lawrence	1861-62. 1st Nov., 1864-70. 1871 to 1873. 1877 to 1888. 1888-91.
Michaud, Cléophas ...	Engineering Staff, Public Works, harbour surveys..... do do do	June, 1873. 1884-85, 1887-88, 90.
Mignault, J. O. C., B.A.	Engineering Staff, Public Works, do	1884-87-88.
	Reconnaissance of Gatineau River, and upper waters of the Ottawa Valley	1889.
Millidge, E. G.	Resident Engineer, St. Peter's Canal, Enl. Cape Breton, &c. Canal commenced by Nova Scotia Government in September, 1854, suspended 1856, resumed in 1866, and completed in 1869. Enl. 1875-1881. Total cost to 30th June, 1889, \$677,267.27. Assistant Engineer, Public Works, Maritime Provinces... Resident Engineer, Antigonish,—Public Works and sur- veys, Cape Breton, Guysborough, Antigonish and Pictou Counties, Nova Scotia..... Member Canadian Society of Civil Engineers	1875 to 1881. 1872 to 1888. July, 1889-91. 11th Nov., 1887.
Mills, J. B.	Engineer on the first construction and afterwards on en- largement of the Delaware, Hudson and Erie Canals. Projected Cedars Canal	1833. 1833-47. 1843. 1847-48.
	Cornwall and Williamsburgh Canals..... Chief Engineer, Beauharnois Canal	
	Projected Caughnawaga Canal	
	Chief Engineer of the Genesee Valley Canal, afterwards on the Kanawba projection in Virginia, U.S., after his departure from Canada. Consulting Engineer and vice-president of the Pottsville and Danville road, in Pennsylvania. Consulting Engineer on the Adirondack Railway, State of New York. Afterwards retired to his home in Peekskill, on the Hudson, N.Y. Born in Chester, 27th March, 1800. Died at Peekskill, N.Y., 29th June, 1871.	

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Mills, J. B.— <i>Cont.</i>	NOTE.—John Jonas, Hon. John Hamilton, John Macaulay, Philip Vanquoghnet, Hiram Norton, George Longley and Peter Shaver were appointed Commissioners to report on improvement of navigation of the St. Lawrence, 1833. John Jonas, President. Samuel Keefer appointed secretary to the Commissioners, 28th March, 1833. The Commissioners' first report is dated 13th Dec., 1833.	
Minnitte, R. C.	Basé Verte Canal, first survey for a canal of about 4 feet draught, to be fed by fresh water, through valley of Au Lac to the Missignash Lakes and thence to River Tidnish.....	Oct., 1822.
Moberley, Frank.....	Engineer, Collingwood Harbour Works..... Previously employed on Railways.	8th Aug., 1890.
Monro, Thomas.....	On Grand Trunk Railway, surveys and construction, Montreal to Kingston, and St. Lawrence Bridge Survey, Montreal; also, Water Works survey and plan, Montreal..... On Toronto and Georgian Bay, proposed canal, in charge of summit level survey..... Assistant Engineer, Hamilton Water Works; Resident Engineer, Hamilton and Port Dover Railway..... Public Works, Ontario, &c., Harbours of Refuge; water supply to Public Buildings, Ottawa, &c..... One of the Government Inspectors of Railways..... Engineer of Water Works, Pitt Hole City, Pennsylvania..... Survey, Lake Shebandowan on the Dawson route..... Welland Canal enlargement, survey and location..... Engineer in charge of Welland Canal..... Resident Engineer, Northern Division, Welland Canal enlargement..... Invited to International Congress of Navigation at Brussels..... Member of Institution of Civil Engineers, Great Britain..... Member Canadian Society of Civil Engineers..... Aqueducts, Merrittton, Simcoe and Niagara Falls..... Examination and report, projected enlargement of Beauharnois Canal, and on projected new canal, north shore, County of Soulanges, and preliminary location survey, &c.....	1850 to 1857. 1857. 1857 to 1859. Feb., 1860-69. 1st May, 1863. 1865. 1869. 1870-71. July, 1872, to 31st Jan., 1873. 1873-88. 30th April, 1885. 20th Jan., 1887. 1888. 1890-91.
Moody, Lieut., R. E.....	Survey of Lake St. Peter with Capt. Boxer.....	1844.
Mooney, William.....	Engineering Staff, Lachine Canal enlargement, Montreal Division..... Yamaska lock and dam, &c., Assistant Engineer..... Died 2nd January, 1885.	1873. 1880-84.
Moore, Robert, Master Mariner.....	Report with John McTaggart on Burlington Bay Canal...	30th March, 1827.
Morris, Wm., M.I.C.E.....	Engineer with Knapple, Princess Louise Docks, Quebec and Lévis Graving Dock... Esquimalt Graving Dock... See Knapple & Morris.	1875-82. 1879-83.
Mortimer, Henry J.....	Assistant of Samuel Hazlewood, District Engineer, Canadian Pacific Railway. Profile and location Lock—Fort Frances Canal, at foot of Rainy Lake, on the Dawson Route..... Plan of Lock, &c., afterwards modified by G. F. Baillairgé, Assistant Chief Engineer, Public Works..... See Baillairgé, Hazlewood, Sutherland, H. Thompson.	1875. 1876.

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Mothersill, George A....	London and South-West Railway, England Missouri Pacific Railway, and M. K. and Texas Railway; Contracting Intercolonial Railway; Engineering Staff and Sub-Con- tractor With Chief Engineer of Canals at Head-quarters, Ottawa	1859-63. 1868-69. 1869-72. 1873-91.
Monro, Alex., P.L.S.	Assistant Engineer, Baie Verte Canal. Survey by G. F. Baillarge One of the Historians of New Brunswick and Nova Scotia.	1871-1873. 1885.
Murdoch, William	Collingwood Breakwater, Lake Huron. Port Arthur, River Kamistiquia, &c., Ontario, harbour works, Resident Engineer, Public Works, Lake Super- ior. Previously employed, chiefly on the Canadian Pacific, Pic- ton and Trenton, Manitoba and South-Western, North- West Central and Hudson Bay Railways, as Resident, District or Chief Engineer. Member Canadian Society of Civil Engineers.	1871. 15th Oct., 1884-91. 1871 to 1884. 20th Jan., 1887.
Murphy, Martin.....	Provincial Engineer, Nova Scotia. Member Canadian Society of Civil Engineers.	1867-91. 3rd Feb., 1887.
Nagle, Gerald J.	First Superintendent, Ottawa River slides and booms Specification, River Trent slides and booms.	1843 to 1846. 28th June, 1843.
Nelson, J. M.	Floods at Montreal, Assistant Harbour Engineer.	1884.
Nichol, Col. Robert, Commanding R. E.	Rideau Canal route surveyed under his orders by Captain Jebb, R. E.	1815.
Nicolls, Gustavus, Col., R. E. (Lt. Col., 1816, Col., 1832)	Succeeded Col. Elias Walker Durnford in command of R. E. and Ordnance Canals Special Report, Carillon Canal.	1831. 5th May, 1834.
Nish, A. G.	Chief Engineer, harbour works of Montreal, and ship chan- nel, River St. Lawrence, Montreal to Quebec. Afterwards contractor on Government works at Esquimaux graving dock, British Columbia, &c., up to 1883. Died 31st January, 1888.	1864 to 1875. 24th Feb., 1880-83.
Norman, Thomas E.	Chats Canal, north side River Ottawa Report on survey of the islands and on the water power of the Chats Rapids, River Ottawa.	1853. 1st March, 1858.
Normand, J. B.	River St. Maurice, slides, booms, dams, piers. Appointed Commissioner to report on cause of floods be- tween Quebec and Montreal. Report on causes of floods. Acting Superintendent, River St. Maurice slides and booms.	1853-89. 4th Oct., 1873. 21st Feb., 1874. 1875-78.
Odlum, Ed. John.	Assistant Engineer, Welland Canal enlargement, Southern Division Engineer in charge, improvements Welland Canal.	Nov., 1872-88. June, 1889-91.
Obfield, Lieut.-Col. J., Commanding R. E.	Report on experiments, blowing in gates at Quebec.	11th, 13th July, 1840.
Ostell, John	Architect, Surveyor and Engineer, Montreal.	1847-48.
Page, John, sen.	Assistant Engineer and draughtsman, Welland Canal Assistant to Chief Engineer, Welland Canal. Consulting Engineer, Welland Canal. Resident Engineer, Junction and Williamsburgh Canals. Superintending Engineer, canals below Kingston.	1842. Sept., 1842. 1846. 1850-51. 1852-53.

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Page, John, sen.	Chief Engineer, Public Works, Provinces of Quebec and Ontario	5th Nov., 1853.
	Deputy Commissioner, Public Works, Quebec and Ontario.	8th March, 1864.
	Chief Engineer, Public Works, Canada	15th March, 1864-79.
	Welland Canal enlargement, survey commenced	1870.
	Reports on enlargement of canals, Lake Erie to Montreal.	1872 to 1877.
	Report on proposed Baie Verte Canal	10th Dec., 1873.
	Special and general report on canals, River St. Lawrence.	16th Feb., 1880.
	Chief Engineer of Canals of Canada	1879-90.
	Fourth President, Canadian Society of Civil Engineers, proposed for 1890	1890.
	A member of Royal Commission to examine and report on Montreal Harbour improvements	1890.
	Died in his office, Ottawa, 2nd July, 1890, aged 75.	
Page, John, jun.	Lachine Canal enlargement, Engineering Staff	April, 1876-79.
	Assistant Engineer, Cornwall Canal	1880-85.
	Died 14th April, 1885.	
Papineau, L. G.	Engineering Staff, Public Works, at Montreal, &c.	1880-84.
	do do Chambly Canal, &c.	1881-83.
	do River Richelieu survey, &c.	1884-91.
	Associate member Canadian Society of Civil Engineers	24th Feb., 1887.
Painchaud, Antoine ...	Resident Engineer, construction of roads between Gaspé Basin and the St. Lawrence	1858-67.
	President of Corporation of Land Surveyors, P.Q.	1884-90.
Parent, Etienne H.	Seigniorial Cadastral Office	1856-59.
	At headquarters and on surveys, &c.	15th Sept., 1864-71.
	Resident Engineer, Grenville Canal	July, 1872-78.
	Superintending Engineer, Carillon, Grenville, Culbute canals	4th Feb., 1879, to 1st May, 1880.
	do Lachine, Beauharnois, Chambly Canals, St. Urs Lock and Dam, &c.	12th May, 1880-91.
	Member Canadian Society of Civil Engineers	20th Jan., 1887.
Pariseau, L. S.	Engineering Staff, Grenville Canal enlargement	1878 to July, 1884.
	do River Richelieu survey	1885-91.
	Associate member Canadian Society of Civil Engineers	24th Feb., 1887.
Pearse, B. W.	Resident Engineer, Public Works, British Columbia	July 1871 to 1881.
Perley, George E.	Engineering Staff, Ottawa	2nd June, 1884-88.
	Assistant Engineer, Kingston graving dock	June, 1888-91.
Perley, H. F.	Engineer Staff, Government of New Brunswick	Feb., '48, to June, '52
	do do	Aug., '56, to Dec., '60
	do Nova Scotia	May, '63, to Aug., '65
	Engineer in charge of Government Railways, New Brunswick	May, '70, to May, '72
	Engineer in charge, St. Peter's Canal, Cape Breton	31st Jan., 1880-90.
	Superintending Engineer, Public Works, Maritime Provinces, Federal Government	1st May, 1872.
	Chief Engineer, Public Works, Canada	25th Nov., 1880-91.
	Chief Engineer, harbour works, Quebec; graving dock, Lévis	Sept., 1883-90.
	Montreal Flood Commission	1886-88.
	Chief Engineer, ship channel, Montreal to Quebec	31st Dec., 1888-90.
	Vice President, Canadian Society of Civil Engineers	24th June, 1887-90.
Perry, Capt. Geo. H.	Chats Canal, Ottawa and French River surveys	1853-58.
	Resident Engineer, Culbute Canal, Upper Ottawa	Sept., 1873-87.
	Died 1888.	
Phillipotts, Lieut.-Col. R. E.	Engineer in charge of Cornwall Canal construction	1836.
	Reports on inland navigation of Canada, by order of Lord Durham, dated 19th Oct., 1838	31st Dec., 1839, to 3rd Aug., 1840.
	Reports on proposed enlargement of Welland Canal, etc.	1841-43.

ENGINEERS Employed on Public Works, Canada—Continued.

Engineers.	Works.	Dates of Employment, &c.
Pilkington, Woodford, M. I. C. E.	Resident Engineer, harbour works, Quebec, and graving dock, Lévis. Now employed in India.	1876 to 1883. 1889.
Piper, Capt. R. E.	Commissioner, harbour works, Montreal.	1830-32.
Plunkett, E. W.	Plans, estimates, etc., Harbour Works, Quebec.	15th Dec., 1874.
Pound, Nicholas.	Engineering Staff, Public Works, harbour surveys.	1888, 89, 90.
Power, Samuel.	Principal Engineer on Welland Canal. Specification for construction of lock gates, Welland Canal.	1842-45. Oct., 1843.
Pringle, Thomas.	Member of Commission to report on Water Power, Lachine Canal.	1887.
Prichard, M. B.	Assistant Engineer, Welland Canal.	1843-44.
Rassaf, Col. de, Russian Engineer.	Submarine Engineer. Examined River St. Lawrence rapids from Lake Ontario down to foot of Lake St. Louis, at Lachine, with Maillefert.	1854.
Ranney, G. W.	Superintending Engineer, River Trent canals, slides, dams, and booms, from Trenton, Lake Ontario, up to Lake Seaugog, inclusive. Member Canadian Society of Civil Engineers.	4th May, '55, to July, 1873. 20th Jan., 1887.
Read, Capt. J. M.	Royal Staff Corps of Engineers, Imperial Government. In charge of Grenville Canal construction.	1824.
Rershall, James M.	"A Civil Engineer of considerable eminence." Consulting Engineer with Hon. H. H. Killaly, Capt. Bayfield and Capt. Beaufort, on the Lake St. Peter navigation project.—See Killaly's Report, 1843-44. Report on Welland Canal—in progress.	31st May, 1830.
Rheauime, L. N.	Engineering Staff, Lachine Canal, second enlargement .. Rapide Plat Canal enlargement. Cornwall Canal do. Member Canadian Society Civil Engineers.	1st Nov., 1877-84. Dec., 1884. 1st July, 1885-91. 20th Jan., 1887.
Richard, J. F.	Harbour surveys, Province of Quebec.	1881-89, 91.
Richards, G. H., Capt. R. N.	Admiralty Charts, British Columbia, Pacific coast.	1858-63.
Rigney, James.	Engineering Staff, roads, Eastern Townships, P.Q. Superintending Engineer, Cornwall Canal. Assistant Engineer, River Trent works at Bobcaygeon, &c. Died in California, 6th August, 1863. Interred at London, Ontario.	1842. 1843. 1843-49.
Ritchie, Thomas.	Engineering Staff, Maritime Provinces.	1888.
Roberts, Nathan S. Eng.	Assistant Engineer, with Benjamin Wright, on Erie Canal. Examination of route for projected Welland Canal with Messrs. Hall and Clowes, British engineers. Report on projected Welland Canal. Engineering Staff, construction Welland Canal—appointed Canal commenced 30th Nov., 1824. do opened 30th Nov., 1829. Wooden locks 110 by 22; 7½ feet water on sills. First Directors Welland Canal Co., appointed 15th May, 1824. Sir John Henry Dunn, Wm. H. Merrit, John Decon, Samuel Clowes and George Keefer, Chairman.	1816. 1824. Aug., 28, 1824. 1st April, 1825.

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Robertson, G. E.....	Engineering Staff, Lachine Canal, second enlargement, Lower or Montreal Division, &c..... Cornwall Canal enlargement, upper half	Aug., 1873-85. July, 1885-91. 20th Jan., 1887.
Robinson, Arthur G.....	Assistant Engineer, Lachine and Chambly Canals.....	1843-48.
Rogers, R. B.....	Assistant Engineer, River Trent slides, booms and canals. do Midland Division, Grand Trunk Railway do Survey Trent Valley Canal.....	1878 to 1881. 1881 to 1882. 1882 to 1883.
	Superintending Engineer, River Trent slides, booms and locks	1st July, 1884-91.
	Bachelor of Applied Sciences and member Canadian Society of Civil Engineers.....	12th May, 1888.
Rosa, Joseph.....	Engineering Staff, roads, bridges, piers, harbours and river improvements, &c., Province of Quebec..... Assistant Engineer, Baie Verte Canal Survey..... do Cedars' Canal Survey.....	29th May, 1856-91. 1870-72. 1872-75.
Rosamond, Joseph A....	Report, River St. Francis, Pierreville Mills..... Engineering Staff, Lachine Canal enlargement..... Resident Engineer, Murray Canal, Lake Ontario..... Member Canadian Society of Civil Engineers.....	13th July, 1875. June, 1876-82. June, 1882, to 1891. 24th Feb., 1887.
Ross, John LeBreton....	Engineering Staff, Public Works, Ontario and Quebec.... Died, May, 1876.	December, 1856-76.
Rowan, James H.	Engineering Staff, Public Works, canals and railways.... Subsequently District Engineer, Canadian Pacific Railway, Manitoba.....	May, 1860-72. 1872 to 1882.
Roy, Charles F.	Harbours, Province of Quebec and Maritime Provinces.... Ship channel between St. Roch and He-aux-Coudres	1879-80. 1881.
	Was elected for the County of Kamouraska as Member of the House of Commons, 1877-78. Died, 13th April, 1882.	
Roy, Thomas.....	Report on Roads, Province of Ontario.....	March, 1839.
Roy, George P.....	Engineering Staff, Public Works, harbours, Quebec.....	1881-82, 1884.
Roy, Joseph R.....	Engineering Staff, Public Works, river and harbour surveys, Quebec..... Associate Member of Canadian Society of Civil Engineers.....	1883-84. 24th Feb., 1887.
Royal Staff Corps, Imperial Government	Cascades, Split Rock, Coteau du Lac, Old Fort. Canals enlarged, locks 12 feet wide, water 3½ feet	1817.
	Ordnance canals, north side River Ottawa, at Carillon, Chute à Blondeau and Grenville. Locks 108 by 20 and 130½ by 32½, with 6 feet water on sills, designed	1819.
	Completed.....	1833.
Rubidge, F. P.....	Surveyor, Eng., &c., River Trent and other works	1836-41.
	Assistant Chief Engineer, Public Works, and Architect of Canada prior to and after Confederation.....	15th Dec., 1841, to July, 1871.
	Report on proposed landing piers below Quebec.....	15th Nov., 1846.
	In charge of surveys and investigations, &c., Lake St. Peter.	1847.
	Report on River L'Assomption lock, dam and dredging....	27th Dec., 1848.
	do bridges, &c., Province of Quebec, &c.....	29th Nov., 1848.
	Plans of bridges constructed across Rivers St. Maurice, Champlain, Ste. Anne de la Perade, Jacques Cartier, on Provincial Highway, north shore of St. Lawrence,—and Rivers Etchemin, Beaucecour, Godfroi, Nicolet, Melbourne, Chateaugay, &c., on Main Roads, south side of St. Lawrence.....	1843 to 1849.
	Projected docks at "Cap Rouge," above Quebec. Survey and report	1846.

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Rubidge, F. P.	Construction and improvements Parliament buildings and residence of Governors General, &c., at Quebec, Montreal and Toronto.....	1844 to 1865.
	Fourteen District Court Houses and Jails constructed in Province of Quebec.....	1859 to 1862.
	Commission of Enquiry, Ottawa Parliament and Departmental Buildings.....	1862-63.
	Improvements—Governor General's residence, at Rideau Hall, Ottawa.....	1865-1871.
	Reports on buildings and other works.....	1846 to 1871.
	Superannuated.....	July, 1871.
	Residing in Montreal.....	Dec. 1890.
Rubidge, Thomas S.	Engineering Staff, Williamsburgh Canal, construction.....	1844-48.
	Superintending Engineer, deepening Galops Rapids, work commenced 1876 and completed 1882.....	1875 to 1882.
	Superintending Engineer, Murray Canal, between Bay of Quinté and Presqu'île Bay, north shore Lake Ontario.....	1881 to 1886.
	Superintending Engineer, Burleigh Canal, Buckhorn Canal, Fenelon Falls Canal, &c., on the River Trent, works commenced 1882, completed 1888.....	1881 to 1888.
	Superintending Engineer, Williamsburgh Canals. Enlargement, &c.....	1880.
	Superintending Engineer, Cornwall Canal enlargement, &c. Work commenced 1876 on lower half from Cornwall upwards.....	1876-1891.
Russell, Lindsay A.	Engineering Staff, Public Works, survey Dawson Route, Fort William on River Kaministiquia near Thunder Bay, Lake Superior, to Fort Garry (Winnipeg), Manitoba.....	1857-1859.
Russell, Alexander J.	Superintending Engineer, roads and bridges along north shore Baie des Chaleurs from Cross Point to Gaspé Basin.....	1841 to June, 1846.
	Rimonski bridge contract, S. Bradley, and Jos. Garon.....	23rd Nov. 1844.
	Died 12th November, 1887.	
Scott, David.....	Assistant Engineer, Ottawa River slides and booms.....	1st Oct., 1854-91.
Scott, William.....	Report on foundation works, Point Pelee Light House.....	1855-56-58.
	Report and Estimates, Rondeau Harbour.....	1857.
Scott, W. R.	Sub-Assistant Engineer, Welland Canal.....	1843.
Scott, W. L.	Assistant Engineer, Montreal Harbour Commissioners.....	19th May, 1875.
	Member Canadian Society of Civil Engineers.....	20th Jan., 1887.
Secord, William F.	Engineering Staff, S. Division, Welland Canal enlargement.....	Oct., 1872, to Nov., 1888.
Shanly, Frank.....	Formerly City Engineer of Toronto. Appointed Chief Engineer, Intercolonial Railway.....	23rd June, 1880.
	Died 13th Sept., 1882.	
Shanly, Robert.....	Canal survey, Ottawa to Lake Huron.....	1857-58.
Shanly, Walter.....	Superintending Engineer, Beauharnois Canal construction.....	1842-48.
	Consulting Engineer, Welland Canal.....	Jan., 1846.
	Chief Engineer Bytown and Prescott Railway.....	1851-54.
	Report, Welland Canal enlargement.....	11th Oct., 1854.
	Proposed ship canals, River Ottawa, Montreal to Lake Huron.....	1857-58.
	Inspector of railways, and Engineer on various works.....	29th Oct., 1864-91.
	Elected Member of the House of Commons, 1863-72, July, 1885-90.	
	Engineer of Royal Commission to examine and report on plans for the improvement of Montreal Harbour.....	1890-91.
	Member Canadian Society of Civil Engineers.....	24th Feb., 1887.

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Shaw, W. M.	Specifications, &c., Hamilton and Port Dover Road, London and Brantford, Brantford and Woodstock	1842-44.
Simmons, Lieut. J. A., Royal Engineer.	Report of an experiment made at Quebec, 13th July, 1840, to destroy a barrier gate by gunpowder.	17th July, 1840.
Sims, A. H.	Reports on roads, &c., District of Gaspé.	1847-48.
Simpson, Frank.	Engineering Staff, Welland Canal, N. Division.	1876.
Sippell, John G.	Superintending Engineer, canals, Province of Quebec, excepting Ottawa Ordnance Canals, until 1857. Superintending Engineer, Lachine and Ottawa Canals enlargement	July, 1853 to 1877. 1870 to 1877.
	Consulting Engineer, Lachine and Ottawa Canals	1877-79.
	Died, 26th September, 1879.	
Sirois, Joseph Eustache.	Engineering Staff, harbour works, below Quebec, and straightening of ship channel between Quebec and Ile-aux-Coudres	1881-90.
Slater, James Dyson.	Welland Canal, Assistant Engineer. Assistant Engineer on the Ottawa River slides and booms. Engineer on macadamized roads, Ottawa to Aylmer and Bell's Corners. Resident Engineer, location and construction of Bytown and Prescott Railway, under Walter Shanly, Chief Engineer. Montreal, Bytown and Pembroke Railway surveys. Ottawa ship canal survey, with James Stewart, C.E., &c., Robert Shanly, G. H. Perry, T. E. Norman and Mackenzie.	1842-46. 1846 to 1849. 1849-51. 1851-54. 1854-56. 1857-58.
	Superintending Engineer, Rideau Canal, &c.	10th June, 1858, to
	Resigned on 12th September, 1872.	1st Oct., 1872.
	Died, 26th October, 1876.	
Smith, D. C.	Superintendent of light-houses above Montreal.	21st June, 1855-80.
	Died, 1st May, 1880.	
Smyth, Major General Sir J. Carmichael.	Born in London. Commissioned in Royal Artillery. Transferred to Royal Engineers. Married to Harriet, daughter of Gen. Robert Morse, R.E. Baronet. Major General. Report on Welland Canal. Joint report and estimate of proposed Rideau Canal works, together with Lieut.-Col. Sir G. Hoste and Major Harris, R.E., recommending locks 108 by 20 feet, with a depth of 5 feet water. Reported to the Board of Ordnance adverse to Col. By's "enlarged views" touching the construction of projected canals. Col. By wrote to General Mann, 13th July, 1825, recommending that for commercial and military purposes it was expedient to construct the canals of sufficient size to admit the passage of steamers 110 to 130 feet in length, 40 to 50 feet wide, and drawing 8 feet of water. The following were the canals referred to by Col. By, and his estimate of their cost, viz. :— Welland Canal, £400,000; Rideau, £400,000; Grenville, £100,000; north side Island of Montreal, £150,000; Richelieu, £150,000. In deference to Major General Sir James Carmichael Smyth's Report, the canals were ordered to be constructed on the limited dimensions first determined on. See Mr. Douglas Brymner, Archivist's Report, 1889	22nd Feb., 1779. 1794. 1795. 28th May, 1816. 1821. 1825. 1825. 1825. 1825.

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Smyth, Major General Sir J. Carmichael.....	Author of "Précis of Wars in Canada, 1755 to Treaty of Ghent, 1814." Published for private use by order of the Duke of Wellington..... And afterwards by his son, Sir James Carmichael Smyth... Appointed Governor of British Guiana..... Died at British Guiana, 4th of March, 1838.	1826. 1862. 1833.
Snow, W. B.....	Engineering Staff, Public Works, Ottawa..... Harbour surveys, Ontario, Quebec and Maritime Provinces Previously employed chiefly on railways and other important works in England where he acted as agent to the Bishop of Durham, after which he was employed in Africa..... On various works in Canada.....	1st Aug., 1880-91. 1882 to 1887. 1837 to 1876. 1876 to 1880.
Soare, W. F.....	Engineering Staff, Public Works, harbours, Ontario..... Died at Port Stanley, 1889.	1885.
Spence, J. B.....	Engineering Staff, Railways and Canals, Ottawa, &c.....	Oct., 1876-91.
Stark, David.....	Sub-Assistant Engineer, Welland Canal..... Secretary, Commission of Enquiry, Ottawa Parliament Buildings..... Report on supplementary survey, Baie Verte Canal..... Superintending Engineer, River Ottawa canals..... do River Trent, new works, completion.	1843. 1862-63. 27th Dec., 1872. 1st May, 1880-90. April, 1887-88.
St. George, Percival W..	On Flood Commission, Montreal..... Engineer and road surveyor, Corporation of Montreal..... Member of Council, Canadian Society of Civil Engineers.	1886-88. 3rd Dec., 1883-91. 1887-91.
St. Laurent, Arthur.....	Engineering Staff, Public Works, harbour surveys, Province of Quebec..... Employed as draughtman at head-quarters.....	1885-89. 1889-91.
Steckel, Louis Joseph Rene.....	Assistant Engineer of G. F. Baillairgé on survey of south shore St. Lawrence, Gulf Road, Ste. Anne des Monts to Cape Rosiers and Gaspé Basin..... Engineering Staff, Public Works, Ontario and Quebec..... Chief Assistant Cedars Canal Survey..... Survey and borings, Princess Louise Basins, Quebec..... Engineering Staff, Chief Clerk, Canada..... Hydrographic survey and Geodetic levels, Rivers St. Lawrence and Richelieu..... Member Canadian Society of Civil Engineers.....	Jan., 1861-62. April, 1863-74. 1874-75. 1875-76. 1st July, 1880. July, 1881-90. 9th Feb., 1888.
Stehelin, Captain, R.E..	Assistant General Superintending Engineer, construction Grenville Canal.....	1819-33.
Stevenson, Alexander....	Survey with André Trudeau for projected canal between Lakes St. Francis and St. Louis..... Report on projected Beauharnois Canal by A. Stevenson and N. H. Baird..... Adopted on recommendation of Samuel Keefer in his report, 17th February, 1842.	1830-31. 1835.
Stewart, James.....	Engineering Staff, Public Works, &c., on various works... Map of ice shoves at Montreal, St. On's Lock, Beauharnois Canal..... Road proposed from Malbaie to Ha! Ha! Bay, Saguenay... Survey and plans, proposed piers below Quebec..... First General Report on Public Works up to..... Beauharnois and Lachine Canals surveys and new works... On Grand Trunk Railway..... Ottawa and Lake Huron proposed ship canal survey.... See Walter Shanly's Report, 22nd March, 1858.	1843 to 1858. 1843-44-45. 1847. 1846-47. 1849. 1847-54. 1854-55-56. 1857-58.
Stoker, George.....	Assistant Engineer, Welland Canal.....	1864.

Engineers Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Strong, W. O.....	Engineer in charge, under H. F. Perley, Chief Engineer of Public Works, of Graving or Dry Dock at Kingston, Lake Ontario..... Plans and specification of dock, signed by H. F. Perley, Chief Engineer of Public Works..... Length of dock, 280 feet. Width of dock, 79 feet at coping level; 47 ft. on floor. Entrance width of dock, 55 feet. Depth at entrance of dock, 15½ feet below the low water of Lake Ontario. Height of water varies 3½ feet. Contract signed by N. K. and M. Connolly and commenced..... Date of completion stipulated	1st Dec., 1888-91. 14th Feb., 1889. 23rd April, 1889. 23rd April, 1891.
Sullivan, J. H.....	Engineering Staff, Public Works, improvement of rivers, &c..... Resident Engineer, deepening feeder, Lake St. Francis to River St. Louis..... River Assiniboine improvement	1880-87. 1883-85. 1886.
Summerville, Peter.....	Assistant Engineer, Public Works, surveys Victoria Harbour and Fraser River, British Columbia..... Member Canadian Society of Civil Engineers.....	1st Aug., 1883, to 6th July, 1887. 9th Feb., 1888.
Sutcliffe, John.....	Engineering Staff, Lachine Canal enlargement..... do Ste. Anne Canal..... St. Gabriel Basins, Lachine Canal..... Left service, May, 1886. Member Canadian Society of Civil Engineers.....	16th July, 1872-81. July, 1881-86. Aug., 1882-86. 27th June, 1888.
Sutherland, Hugh.....	Superintending Engineer, Fort Frances Canal, at foot of Rainy Lake, on the Dawson route..... Canal, 800 feet long, with a lock 200 feet by 36½ feet, and 7 feet depth of water on lower sill during low water, opening navigation from Kettle Falls, at Head of Rainy Lake, to N.-W. angle of Lake of the Woods, 164 miles. Work commenced..... do completed, except lock gates..... Cost of construction, \$288,278.51, to..... See Baillarge, Hazelwood, Mortimer, H. Thompson.	1875-79. 14th June, 1875. 1878. 22nd Jan., 1879.
Swift, W. H. (from Boston, U.S.)	Consulting Engineer, Caughnawaga Canal, recommends route proposed by J. B. Mills, 19th February, 1848....	6th June, 1855.
Symmes, H. R.....	Superintending Engineer, River St. Maurice, slides and booms, &c..... Died 8th October, 1875.	24th Feb., 1858, to 8th Oct., 1875.
Taché, Joseph Charles..	Engineering Staff at Head-quarters..... Chief Draughtsman..... Harbour works, &c., below Quebec, surveys and construction	29th Jan., 1872. 1st July, 1883-91. 1882 to 1889.
Taggart, Nathaniel.....	Patentee of lock gates of solid timber for canals.....	1843.
Tait, Charles Maitland..	Employed on survey of Beauharnois Canal.	1842-43.
Tait, T. M.....	Engineer of harbour works, Montreal.....	1845 to 1848.
Talcott, W. H.....	Report on Shubenacadie (Chikabouakady) Canal..... Survey, report and estimates, St. Peter's Canal..	1855-56. 1856.

ENGINEERS Employed on Public Works, Canada—*Continued.*

Engineers.	Works.	Dates of Employment, &c.
Taylor, Thomas Dixon.	Assistant Engineer, construction Intercolonial Railway... Surveys and construction Canadian Pacific Railway. Also employed during part of. Railway survey, Newfoundland..... Resident Engineer Tay Canal.....	May, '69, to Dec., '74. Feb., '75, to Sept., '77. 1878-79 and '80. July to Dec., 1880. March, 1882, to Jan., 1889.
Taylor, Mr.	Master attendant Kingston Dockyard prior to..... Survey of Lake St. Peter with Capt. Boxer.....	1845. 1844.
Taylor, David.....	Survey of canal route, Lake Huron to Ottawa River..... Reported thereon together with David Thompson and William Hawkins, to the Hon. John Macaulay, Surveyor General of Upper Canada, John S. Cartwright and Capt. Baddeley, Royal Engineers, according to an Act of the Parliament of Upper Canada, of 4th March, 1837. <i>See App. 30, pp. 837 to 847, by G. F. B., Public Works Report, 1867-82.</i>	1837.
Telford, Thomas.....	Founder of the Institution of Civil Engineers, Great Britain, incorporated 3rd June, 1828. Report on projected Shubenacadie Canal; and also on Baie Verte Canal, between Bay of Fundy and Gulf of St. Lawrence.....	1825-26.
Temple, E. B.....	Assistant Engineer, North Shore Railway..... do do by Govt. of Quebec..... Division Engineer, Location Newfoundland Govt. Railway. do Toronto, Grey and Bruce Railway..... Assistant Engineer, Ontario Division, C.P.R..... Resident Engineer, Toronto Harbour Works, appointed..... Elected Member Canadian Society of Civil Engineers.....	May, '71, to Oct., '75. May, 1876, to Ap. '80. 1880. June, '81, to Oct., '83. Oct., '83, to Mar., '88. April, 1888. 23rd May, 1889.
Thom, G., Brevet Brig- adier General, U.S.A..	Report on saw-dust obstruction in navigable rivers.....	27th Aug., 1872.
Thompson, David.	Astronomer and Surveyor, engaged in surveying and defin- ing boundary line, for Great Britain, between Canada and the United States..... In the report of the British and United States Commissioners appointed to trace the line of boundary under Art. VII of the Treaty of Ghent, dated 23rd Oct., 1826, Mr. Thompson is spoken of as principal surveyor to the Board and as signing in that capacity the 34 maps prepared. <i>See Hertslet's Commercial Treaties</i> , vol. 13, page 906. On the River St. Lawrence..... Survey of Lake of the Woods..... Principal consulting engineer Welland Canal..... Survey of Lake St. Francis, &c..... Survey of canal route, Lake Huron to Ottawa River..... Survey of Lake St. Peter channel and estimate of proposed dredging for ship channel.....	1816 to 1827. 1817. 1825. 1825-28. 1832-34. 1837. 1841.
Thompson, E. W.....	Assistant Engineer, Carillon Canal, new locks and dam...	July, 1872-78.
Thompson, H. W.	Assistant Engineer of Hugh Sutherland, Fort Frances Canal, at the foot of Rainy Lake..... <i>See Baillairgé, Hazlewood, Mortimer, Sutherland.</i>	1875-79.
Thompson, H. B.....	Lachine Canal enlargement..... Assistant Resident Engineer, Culbute Canal, Upper Ottawa do do Carillon Canal Enlargement..	Dec., 1872. Sept., 1873-78. 1878-85.
Thompson, H. G.....	Reports on surveys and maps, with soundings of River St. Lawrence above Lake St. Louis.....	Sept. & Dec., 1836-42.

ENGINEERS Employed on Public Works, Canada—Continued.

Engineers.	Works.	Dates of Employment, &c.
Thompson, Lieut.-Col.	Royal Engineer under the Imperial Government. Succeeded Major Bolton, R.E., as Superintending Engineer of the Rideau Canal.	1841.
Thompson, Major Francis Rengler	Testimony re Rideau Canal lands.	18th March, 1845.
Thompson, W. G. McNeil.	Member of Institute, Civil Engineers, England. Resident Engineer, Southern Division, Welland Canal enlargement Resident Engineer in charge, Saint-Ste-Marie Canal, Canada. Entered the service of the Dominion Government in April, 1868, as Division Engineer on surveys and location of the International Railway, and served in Nova Scotia, New Brunswick and Quebec Provinces until the spring of 1872. In charge of the survey of Lake St. Louis. Adolphe Larue, P.L.S., surveyed Lake St. Louis, 1836.	1872-88. Jan., 1889-91. Spring, 1872.
Tibbett, Hiram	Description of a projected route for the Welland Canal.	1823.
Tomlinson, Joseph	Engineering Staff, Public Works, Canada Superintending Engineer, light-houses, Canada Inspector of bridges on railways, &c Superannuated	1st Jan., 1870. 5th May, 1871-80. 9th Feb., 1880-86. 16th Oct., 1886.
Townsend, T. B.	Engineering Staff of Chief Engineer, Public Works, Ottawa Contractor for lock gates, Welland Canal enlargement.	Sept., 1872-80. 17th July, 1880, to 29th July, 1882.
Tracy, B. H.	Survey of projected Caughnawaga Canal route, from Lake St. Louis to Lake Champlain. <i>See</i> Mills, Jarvis, Gamble, Swift.	1834.
Tremblay, A. J.	Engineering Staff, harbour surveys below Quebec Student Canadian Society of Civil Engineers	1888-89. 20th Jan., 1887.
Tremblay, W.	Engineering Staff, Harbour Surveys, Lake St. John.	1889-90.
Trudeau, André	Survey with Alex. Stevenson in connection with improvement of water communication between Lakes St. Francis and St. Louis	1830-31.
Trudeau, Louis E.	Engineering Staff, harbour surveys, &c. do canals, &c., Province of Quebec.	July, 1875-80. 1880-91.
Trudeau, Toussaint	Assistant Engineer on railways, &c., Canada and United States Appointed Secretary of Public Works, Ontario and Quebec. Chief Engineer, Public Works Assistant Commissioner, Public Works, Ontario and Quebec Deputy Minister Public Works, Canada do Railways and Canals, Canada	1846 to 1859. 13th Dec., 1859-64. 8th March, 1864. 15th March, 1864. May, 1868-79. 22nd Sept., 1879-91.
Trutch, Sir J. W., C.M.G.	In charge of Public Works, including Esquimalt Graving Dock, British Columbia Previously Lieut.-Governor of British Columbia. Member Canadian Society of Civil Engineers.	1881 to Jan., 1888. 17th Sept., 1887.
Tully, Kivas	Engineer, Toronto Harbour Commissioners. Proposed Georgian Bay Canal, Lake Ontario to Lake Huron	1853-91. 1845-51.
Twiss, Capt.	Commanding Officer of the Royal Engineers. The first canals on the north side of the St. Lawrence, between Lakes St. Louis and St. Francis, were constructed under this engineer, as designed by Governor Haldimand, between the years.	1779 and 1783.

Engineers Employed on Public Works, Canada—Continued.

Engineers.	Works.	Dates of Employment, &c.
Twiss, Capt.....	They were located at the Cascades, Split Rock, Trou du Moulin and Côteau du Lac, the locks being from 6 to 7 feet in width between the gates with a depth of 2 to 2½ feet of water on the sills, for the passage of small boats, with from 39 to 40 barrels of flour. 263 bateaux, at 10c., 2 canoes and 1 boat, at 5s. each—£132 5 0, for tolls, passed through the then existing canals, during the season of 1781. <i>See</i> his report dated For further details subsequent to the above, <i>see</i> record of Col. Gother Mann, R.E.	3rd Dec., 1781.
Valiquet, Ulric.....	Engineering Staff, Public Works, Ottawa and below Quebec In charge of various works below Quebec.....	May, 1873-89. 1889-90.
Vaughan, Capt.	Engineer in charge, Lévis Graving Dock Superintendent of dredging, new straight channel, Lake St. Peter In charge of light-house at Belle-Île..... Died at Quebec, 9th Dec., 1869.	13th Oct., 1890. 1844-46. 1855-61.
Vavasour, Lieut., R.E.	Engineering Staff, Grenville Canal.....	1840.
Walsh, Edmund J.	Assistant Engineer, Municipality and County Works, Province of Ontario..... Assistant Engineer, C.P.R., Rocky Mountain Division... do Northern Pacific Railway & O. T. Co. Assistant and Division Engineer, C. P. Railway ... Assistant Engineer, Cape Breton Railway—for Department of Railways and Canals..... Engineer in charge of Division on Harvey and Salisbury Location Surveys—for Department of Railways and Canals..... Appointed Engineer for Govt. of Antigua, W.I.....	1877-1880. 1881. 1882. 1882-1885. 1885 to 1889. 1889-1890. 1890.
Walton, D. S.	Engineering Staff, Lachine Canal enlargement, St. Ours lock and dam, Chambly Canal, roads, bridges, &c., Hull to Grenville, By-town to l'Original, &c.....	1843-49.
Weller, J. L.	Engineering Staff, New Trent Canals..... do Cornwall Canal enlargement, lower half.....	July, 1882-88. Aug., 1888-91.
Wells, Alexander W....	Engineering Staff survey, proposed Dawson Route, from Fort William, on the River Kaministiquia, Thunder Bay, Lake Superior, to Fort Garry or Winnipeg, Manitoba.....	1857 to 1859.
Wells, Alphonse.....	Engineering Staff, fixing boundary line under Ashburton Treaty of 1842.	
Wells, Arthur	Engineering Staff, Public Works, Ontario and Quebec, roads, Eastern Townships, and Lachine Canal enlargement, &c.....	1846.
West, James	Specification, bridge across westerly channel of the River Rideau, near its mouth..... Proposed Georgian Bay, Lake Huron and Ottawa Canal...	5th July, 1845. 23rd Feb., 1856.
Westmacott, Lieut. S., R.E.	Report on causes of floods in Montreal.....	29th June, 1841.
White, Lieut. H.A., R.E.	Report on experiment made at Quebec to destroy Sally Port gates with gunpowder.....	11th July, 1840.
Willet, Herbert A.....	Engineering Staff, Grenville Canal..... do South Div. Welland Canal Enlargement.....	1844. Aug., 1881, to Nov., 1888.
Williams, J. B.....	Engineering Staff, Public Works, River Saskatchewan improvement, &c., N.W.T.....	1885-87.
Wis, Frederick Ashford Milbank	Engineering Staff, survey of route for proposed Sault-St. Marie Canal, under S. Keefer, Chief Engineer of Public Works, Canada.....	1852.

ENGINEERS Employed on Public Works, Canada—Continued.

Engineers.	Works.	Dates of Employment, &c.
Wise, Frederick Ashford Milbank.....	On Engineering Staff, Grand Trunk Railway, construction and maintenance On Engineering Staff, Public Works, surveys, harbours, &c., Ontario Resident Engineer, on the construction of the Erie and Niagara Railway, and the Buffalo and Salamanca Branch of the Atlantic and Great Western Railway.... Chief Engineer of the St. Lawrence and Ottawa Railway, and Assistant Engineer of the Ottawa Waterworks.... Superintending Engineer, Rideau Canal, Ottawa to Kingston; and Tay Canal..... Superintending Engineer of the reconstruction of the Tay Canal, from Rideau Lake to the Town of Perth, Ontario. Old canal $8\frac{1}{2}$ miles long, with 5 blocks of $100 \times 20 \times 4$ feet depth of water on sills. Total rise, 28 feet. Built 1831-34, by a private company, under Act William IV, Chap. 2, Sec. 1, and other Acts New canal 7 miles long, with two locks each of 13 feet lift, and 134×32 , with $5\frac{1}{2}$ feet depth of water on sills during low water of river and lakes. Built by Manning & Co., contractors..... And by W. Davis & Co., contractors..... New canal opened Mr. Wise became a member of Canadian Society of Civil Engineers.....	1853 to 1860. 1860-63. 1864-65. 1866-72. 1st Oct., 1872-91. 1882-91. 1831. 15th June, 1883, to 12th July, 1888. 12th July, 1888-90. 1890. 29th Jan., 1887.
Wolfe, Major Alex. Jos.	Superintending Engineer, Kempt Road, from St. Octave de Metis, near the River St. Lawrence, to Cross Point, Baie des Chaleurs.....	1830-32.
Wright, Benjamin	Engineer in charge of Erie Canal, from Genesee to Albany. do Chesapeake and Delaware Canal. do Delaware and Hudson Canal. do Chesapeake and Ohio Canal. Engineer, New York and Harlem Railroad, prior to..... Report on Lake Francis, with map..... Projected Welland Canal enlargement..... do Williamsburgh Canals..... Consulting Engineer, Cornwall Canal.....	1833. 1833. 1833. 1833. 1833. 1833. 1833. 1833. 1833.
Wright, Lieut. Col., I.R.	Commanded R.E. in Canada..... Was appointed Col.....	1818 1821.
Wright, G. B.	Fraser River improvements, British Columbia, report.....	1875-80.
Wright, Capt., R.E.	Report on St. Lawrence Canals..... do land required for Chambly Canal..... Senior Capt., R.E., Montreal Division.....	19th Dec., 1833. 21st April, 1834. 1834.
Yule, Capt. P., R.E.	Superintendent, construction and repairs of St. Lawrence Canals..... Report and estimate, St. Lawrence Canals..... Report on St. Lawrence Canals..... Report of reconnaissance ordered by Lord Aylmer to examine route to connect Quebec with the Atlantic Ocean by a railway through the State of Maine..... Plans, canal and lock proposed at Ste. Anne, south side River Ottawa, instead of old lock, built 1816, in Vaudreuil channel, between Ile Perrot and Vaudreuil, of wood..... New stone lock, north side of river, 190×45 feet, with 6 feet water on sills, built 1840-43. Enlarged stone lock, 200×45 , with 9 feet water on sills and a new channel with crib work and embankment on each side, in the river below the lock, commenced in 1873 and completed towards 1883.	1830. 30th May, 1832. 1833. Aug., 1835. 1835.

APPENDIX No. 20.

SUPERINTENDENTS EMPLOYED
ON THE
PRINCIPAL PUBLIC WORKS
OF
CANADA,
EXCLUSIVE OF PUBLIC BUILDINGS AND RAILWAYS.

1779 to 1891.

SUPERINTENDENTS, &c.

— SUPERINTENDENTS, &c., Employed on the Principal Public Works of Canada, exclusive of Public Buildings and Railways, 1779 to 1891.

Names.	Works.	Dates.
Asst. Supt.	Asst. Superintendent, Lachine Canal.	5th Sept., 1823.
do	do Canal Locks, Lakes St. Louis and St. Francis.	May, 1833.
do	do Burlington Bay Canal. Prior to	11th Oct., 1843.
do do do Fred	Superintending Engineer, various roads, bridges, harbours and canals, Quebec, Ontario and Maritime Provinces.	1833-79.
do do do	Superintending Engineer, River Trent Canals, slides, &c., and Rivers St. Maurice and Saguenay slides, beams, &c.	1833-78.
do do do	Superintending Engineer, Ottawa, Richelieu and St. Lawrence Canals.	1877-78.
For intermediate dates on respective works see		
"Record of Engineers."		
do do do	Superintendent, Ste. Anne's Lock.	April, 1849.
do do do	do Beauharnois Canal.	24th March, 1874-91.
do do do	Superintending Engineer, Trent River Works.	July, 1873-81.
do do do	Superannuated.	1st July, 1885.
do do do	Dead.	12th April, 1886.
do do do	Superintendent, Chambly Canal.	1880-88.
do do do	Superintending Engineer, Construction Esquimaux Graving Dock.	24th Nov., 1883.
do do do	Superintendent, Lewis Graving Dock.	1st April, 1887-90.
do do do	Assistant Superintendent, Sarnia, Brantford and Chatham and Amherstburgh roads.	1843.
do do do	Assistant Superintendent, Burlington Bay Canal.	1872-74.
do do do	do Port Dover harbour.	1872.
do do do	Superintendent, Lachine Canal.	1843 to Jan., 1868.
do do do	Dead.	August, 1869.
do do do	Superintendent, Gosford Road.	1843.
do do do	do Welland Canal.	1874 to 1st Jan., 1880.
do do do	do Burlington Bay Canal.	1875.
do do do	do Beauharnois Canal.	1840 to 1st Jan., 1874.
do do do	do do do	July, '54, to Feb., '57.
do do do	do Robou Canal.	1875.
do do do	do (predecessor) Chambly Canal.	1843-54.
do do do	do Chambly Canal, Chateaux Drive, &c.	31st May, 1843-54.
do do do	do Road Ste. Agathe de Marston to Baie des Haies, Saguenay.	1843-58.
do do do	Superintendent, slides and beams, at foot Lake St. John, and head of River Saguenay.	1st May, 1840-81.
do do do	Superannuated.	1st May, 1881.
do do do	Dead.	Mar. 6, 1882.
do do do	Superintendent, slides, beams, dams, at foot Lake St. John, and head of River Saguenay.	1st May, 1881-91.
do do do	Superintendent, Ottawa River Works.	1st Apr., 1870-91.
do do do	Lockmaster, Carleton and Grenville Canals.	12th Jan., 1872-91.
do do do	Assistant Superintendent, Ottawa River Works.	1st Apr., 1870-91.
do do do	Superintendent, Ottawa River Works.	28th Feb., 1871-91.
do do do	do do do	1st Apr., 1870-91.
do do do	do do do	1st Apr., 1870-91.
do do do	do do do	1st Apr., 1870-91.
do do do	do do do	1st Apr., 1870-91.
do do do	do do do	1st Apr., 1870-91.
do do do	do do do	1st Apr., 1870-91.
do do do	do do do	1st Apr., 1870-91.
do do do	do do do	1st Apr., 1870-91.
do do do	do do do	1st Apr., 1870-91.
do do do	do do do	1st Apr., 1870-91.
do do do	do do do	1st Apr., 1870-91.
do do do	do do do	1st Apr., 1870-91.
do do do	do do do	1st Apr., 1870-91.
do do do	do do do	1st Apr., 1870-91.
do do do	do do do	1st Apr., 1870-91.
do do do	do do do	1st Apr., 1870-91.
do do do	do do do	1st Apr., 1870-91.

SUPERINTENDENTS &c., Principal Works, &c., Canada,—Continued.

Names.	Works.	Dates.
Burnett, John	Superintendent of Works, Lachine Canal	1826.
By, Lt.-Col. John, R.E.	Superintending Engineer, Rideau Canal construction	1826-32.
Callahan, —	do Division, Welland Canal	1836.
Carmichael, Daniel	Superintendent, Lachine Canal	1844-46.
	Died	1846.
Chaloux, Francois	Superintendent, (pro tem) Beauharnois Canal	31st May to Aug. 1873
Chartier, P. Telesphore	do Chambly Canal	1854-63.
Chater, Lt.-Col., R.E.	Superintending Engineer, Rideau Canal	Date not ascertained.
	Succeeded Capt. Chas. E. Ford, who succeeded Lt.-Col. Thompson as Superintending Engineer under Imperial Government, between	1832 and 1852.
Clarke, Isaac Winslow, Dep. Com. Gen.	Superintendent, Cascades, Split Rock and Côteau du Lac Canals, under Imperial Government	1809-1822.
	Died	7th July, 1822.
Cliff, John	Superintendent, Harbour Works, Montreal	1832-45.
Codere, Alfred	do St. Ours Lock and Dam	1st Sept., 1888.
Coffin, Lt.-Col. W.	General Agent Ordnance property, including the Rideau, Carillon, Chute à Blondeau, Cascades, Split Rock, Côteau du Lac Canals, &c. Appointed	Sept., 1856.
	Died	28th January, 1878.
	The last named works were maintained at expense of Provincial Government from 1st Oct., 1853. Their transfer from Imperial Government accepted by Order in Council, 25th January, 1856. Transfer ratified by Prov. Act, 19 Vic., cap. 45.	
Conway, Michael	Engineering Staff, etc., Lachine Canal	19th June, 1856.
	Acting Superintendent	1844 to 1868.
	Superintendent	1868.
	Died	1st April 1869-90.
Cotton, James	Superintendent East and West York and Yonge street roads from Toronto; also roads Hamilton to Port Dover, Dundas, Brantford, &c.	15th Oct., 1890.
	Toronto roads sold to United Counties of York and Peel by Order in Council	7th June, 1864, to 5th July, 1865.
Cull, James	Superintendent, with P. Talbot, Sarnia, Brantford, Chatham and Amherstburgh roads.	5th July, 1865.
		1843.
Daoust, Joseph Lumina	Superintendent, Ste. Anne's Lock	18th Dec., 1878-91.
Dawson, Simon L.	do St. Maurice slides, dams, booms, &c.	1852-57.
	do Route, Lake Superior to Fort Garry	1857-71.
Devereux, Capt. James	do Esquimaux graving dock, British Columbia. Previously in charge of Provincial Government Steamer "Sir James Douglas."	17th Sept., 1887-91.
Donaldson, John	Superintendent of Works, Welland Canal (under Commissioners)	23rd February, 1833.
Donati, L., Dep. Asst. Com. Gen.	Superintendent, Cascades, Split Rock Canals, &c.	1822.
Drummond, —, R. E.	Superintending Engineer, first Suspension Bridge, Ottawa	1826.
Dunlop, Mathew	Acting Superintendent, St. Peter's Canal	1862 to June, 1870.
Dunlop	Superintendent, Lachine Canal	1846-49.
	Died	1849.
DuVernet, Lt.-Col. Royal Staff Corps	General Superintendent, Construction Grenville Canal	1819-29.
	See "Record of Engineers."	
Dwyer, W. O.	Assistant Superintendent, Cascades Road	1843.
Ellis, William	Superintendent, Burlington Bay Canal	1st January, 1880-91.
	do Welland Canal	1st January, 1880-91.
Evatt, H. B.	do Côteau du Lac Canal	1832 to May, 1833
Finlay, John	do Construction, Ordnance Canals	1823-29.
Fairbanks, L. P.	do and proprietor Shubenacadie Canal, (Chikabouakady) N.S.	1855-89.

SUPERINTENDENTS, &c., Principal Works, &c., Canada—Continued.

Names.	Works.	Dates.
Farnsworth, S. H.	Superintendent, Assistant on repairs, &c., Welland Canal.	March, 1833.
Fleming, Peter.....	Superintending and Consulting Engineer, St. Ours and Chamblé Canals.....	1829-31.
	Superintending and Consulting Engineer, Williamsburgh and Cornwall Canals.....	1834.
	Superintending Engineer, Bridges between Montreal and Quebec.....	1843.
	<i>See "Record of Engineers."</i>	
Forbes, W. B., Deputy Comr.-Gen'l.....	Superintendent, St. Lawrence Canals.—Old canals built by Imperial Government.....	1830.
Forbes, William Bilsbury	do Carillon and Grenville Canals.....	1st May, 1867, to May, 1889.
	Previously employed in other capacities.....	15th April, 1855.
	Died.....	29th May, 1889.
Ford, Capt. Chas. E., R.E.....	Superintendent of Works, Grenville Canal.....	1846.
	Superintending Engineer, Rideau Canal.....	
	(Succeeded Col. Thompson under Imperial Government subsequent to 1832.)	
Foreman, Thomas.....	Superintendent, Ste. Anne's Lock.....	1877.
	Previously Lockmaster, Grenville Canals, since.....	1st April, 1868.
Gerard, Arsène.....	Superintendent, Ste. Anne's Lock.....	1877-1st Dec., 1878.
Grant, Donald M., C.E.	do nav. improvements, St. John River, N.B.	1850-53.
Gibbs, Alex'r.....	Assistant Superintendent, Lachine Canal.....	1st June to 31st Oct., 1823.
Gisborne, F. N., M.E., F.R.S., Canada.....	Superintendent General, Government Telegraph and Signal Service.....	1st May, 1879-91.
	<i>See "Record of Engineers."</i>	
Gisborne, Hartley.....	Superintendent, Government Telegraph lines, North-West Territory.....	1st Oct., 1882-90.
Godfrey, Thomas.....	Superintendent, Cornwall Canal.....	1843-49.
	do Beauharnois Canal.....	1849-50.
Gore, T. S.....	Superintending Engineer, Sarnia and Chatham Roads.....	1843.
Goucard, Jos.....	Superintendent, Bridges between Montreal and Quebec.....	1843.
Gzowski, Lt.-Col. C. S.	Superintending Engineer, Roads and Harbours, Western Ontario.....	1842-48.
	<i>See "Record of Engineers."</i>	
Hall, Francis Benjamin	Superintending Engineer, Burlington Bay Canal.....	1825-32.
	<i>See "Record of Engineers."</i>	
Harrison, Robert Newton	Superintendent, St. Ours Lock and Dam.....	6th August, 1851.
Harvey, Charles, R.E.	Superintending Engineer, Rideau Canal, prior to.....	1857.
	(Mr. Harvey was the last Superintendent of this canal under the Imperial Government.)	
	For transfer by Imperial to Provincial Government, <i>see</i> Lt.-Col. W. Coffin, General Agent Ordnance Property.	
Hatt, Augustus.....	Superintendent, St. Ours Lock and Dam.....	11th March, 1853-57.
	Died.....	28th Feb., 1858.
Hayne, Capt., R. S. Corps	Superintendent construction Ottawa River Canals.....	1833-34.
Howard, John.....	do works, Otonabee River.....	16th Nov., 1833.
Hudonville, J.....	do Lachine Canal.....	1842.
Kavanagh, Wallace Morgan	Superintendent St. Peter's Canal, Cape Breton, N.S.....	3rd June, 1870-91.
Keeler, Samuel H.....	Superintending Engineer, Construction Welland Canal.....	24th June, 1846.
	<i>See "Record of Engineers."</i> Died.....	7th Jan., 1890.
Keeler, T. P.....	Superintendent Murray Canal, O.C.....	Aug., 1889.
Kennedy, Edward.....	Superintendent Lachine Canal, appointed.....	8th Nov., 1890.
Kerr, William.....	Superintendent, Works, Burlington Bay Canal, and Secretary to Board of Commissioners, appointed.....	March, 1827.
Killaly, J. S.....	Superintending Engineer, Rideau Canal.....	1st Jan., 1857, to 6th April, 1858.
	<i>See "Record of Engineers."</i>	
Kibly, Daniel.....	Superintendent and Paymaster, Chamblé Canal.....	1843-47.
King, Capt. Wm., R.S.C.	Superintending Engineer, Grenville, Cascades, Split Rock, and Côteau du Lac Canals.....	1825-26.
Lewis, Richard.....	Superintendent bridges between Montreal and Quebec.....	1843.
Lander, Mr.....	Superintendent Montreal Harbour, prior to.....	1834.

SUPERINTENDENTS, &c., Principal Works, &c., Canada—*Continued.*

Names.	Works.	Dates.
Lajoie, Charles	Superintendent, St. Maurice Slides and Booms, &c.	7th Oct., 1878-91.
Larue, Lévis	do St. Ours Lock and Dam ..	24th April, 1858-88.
	Superannuated	1st Sept., 1888.
Laurence, Pierre	Superintendent Beauharnois Canal	10th Feb., 1857, to 30th April, 1871.
Lawson, W.	Assistant Superintendent Sarnia, Brantford, Chatham and Amherstburgh roads	1843.
Lee, Andrew	Superintendent, Burlington Bay Canal on the	11th Oct., 1843.
Light, A.	Assistant Superintendent, Burlington Bay Canal, on the ..	11th Oct., 1843.
Long, Maj. André, Royal Staff Corps	Superintendent, Construction and repairs to Cascades, Split Rock and Côteau du Lac Canals	1817.
Lyons, James	Superintending Engineer, River Trent Works and Light- houses, River St. Lawrence	1843-55.
Macaulay, John	Commissioner, superintending expenditure Welland Canal ..	13th Feb., 1833.
Macdonald, Alexander ..	Superintendent, East and West York and Yonge street Roads from Toronto; also, Roads, Hamilton to Port Dover, Dundee, Brantford, &c.	18th May, 1863-64.
	Toronto Roads sold to United Counties of York and Peel, by Order in Council	5th July, 1865.
Macdonald, Jos. Frobis- her	Superintending Engineer, Lachine and other canals.	1848-52.
	do Temisconata Road	1853-56.
	Died, autumn	1857.
	<i>See "Record of Engineers."</i>	
Macdonell, Duncan Allan	Superintendent, Beauharnois Canal	March, 1846 to 27th Aug., 1849.
	do Cornwall Canal	27th Aug., 1849 to 1st July, 1889.
	Resigned	1st July, 1889.
	Previously employed on Public Works	Oct., 1834 to March, 1846.
Macdonell, Alex. Green- field	Superintendent, Williamsburgh Canals	26th April, 1875-89.
	Died	27th January, 1889.
Mackay, —	Superintendent, Fort Garry and Lake of the Woods Roads ..	1872.
Mann, Capt. J. W., Royal Staff Corps	do Construction, Grenville Canal	1819.
	Report on Navigation of the St. Lawrence	25th Sept., 1818.
Mann, Col. Gother, R.E.	Superintendent-General, Report on Cascades, Cedars and Côteau du Lac Canals	24th Dec., 1800.
	<i>See "Record of Engineers."</i>	
March, S.	Superintendent, Bridges between Montreal and Quebec	1843.
Masse, Joseph A.	do Beauharnois Canal	1st May, 1871 to 31st May, 1873.
McCordock, W. J.	do Dredging, Maritime Provinces	1870-91.
McDonall, Robert	do Assistant, Lachine Canal	1821-23.
McGrath, Thomas	do Works, Newcastle District	Oct., 1843.
McIntyre, Capt. John ..	do of Lighthouses	1848.
McKay, Mr.	do Fort Garry and Lake of the Woods Road	1872.
McLauchlan, —	do Nav. Improvements, St. John River, N.B.	1833-56.
McNab, Alex.	Superintending Engineer, St. Peter's Canal, N.S.	July, 1865 to July, 1867.
McPherson, David	Dock Master or Manager, Halifax Graving Dock	Feb., 1889-91.
McRae, A. M. F.	Superintendent, Chambly Canal (at St. John)	15th April, 1842 to 18th June, 1843.
Merrill, Horace	do Ottawa Slides, Booms, &c.	20th Jan., 1849, 22nd July, 1875.
	do Construction, Grand Mere and Shawene- gan Slides, River St. Maurice	Sept., 1852.
	Superintendent Construction, new Carillon Slide and Dam ..	June, 1879-83.
	Died	22nd May, 1883.
Mills, J. B.	Superintending Engineer, Williamsburgh Canals	1843 to 15th June, 1847.
	<i>See Farran Point, Rapide Plat, Point Iroquois and Galops.</i>	
Morin, Louis	Superintendent, Beauharnois Canal	1st Aug., 1873 to 1st April, 1874.
Nagle, Gerald J.	do Construction, Ottawa River Slides, &c.	1843-44.

SUPERINTENDENTS, &c., Principal Works, &c., Canada—Continued.

Names.	Works.	Dates.
Normand, J. B.	Boom-Master at Mouth of St. Maurice.	1853-91.
	Acting Superintendent, St. Maurice Slides and Booms.	1875-78.
Ouimet, Louis	Superintendent, Chambly Canal.	1877-79.
Paquet, M.	do Bridges between Montreal and Quebec.	1843.
Page, John, sen.	Superintending Engineer, St. Lawrence Canals.	1852-53.
	See "Record of Engineers."	
Parent, Etienne Henri	Superintending Engineer, Carillon and Grenville Canals.	1879-80.
	Lachine, Beauharnois, Chambly, St. Ours Lock and Dam.	1880-91.
	See "Record of Engineers."	
Parley, Henry F.	Superintending Engineer, Works, Mar. Prov.	1872-80.
	See "Record of Engineers."	
Perry, George H.	Superintending Engineer, Culbute Canal.	1873-87.
	Died. See "Record of Engineers."	1888.
Phelan, Daniel	Superintendent Chambly Canal (at St. John) appointed.	18th June, 1843.
Prefontaine, Christopher	Superintendent Chambly Canal	15th Oct., 1863-77.
Ramey, George W.	do Trent Canals, Slides, Booms, &c.	4th May, 1855, July, 1873.
	See "Record of Engineers."	
Redpath, Peter	Superintendent of Works, Chambly Canal (at St. John's).	Prior to 1844.
Reid, John.	do Williamsburgh Canals, appointed.	18th Oct., 1889.
	Died.	13th May, 1890.
Reid, John D.	Acting Superintendent.	1st May, 1890.
Rigney, James.	Superintendent Cascades Road.	1843.
Robinson, William B.	do (Commissioner) Welland Canal.	13th February, 1833.
	do Welland Canal.	1st October, 1837.
	do Lachine do.	1841.
	do Beauharnois Canal.	1845 to March, 1846.
	do Trent River Works.	1st July, 1884-91.
	See "Record of Engineers."	
Rosa, Joseph	Superintendent various Harbour works and Roads, Province of Quebec.	
	See "Record of Engineers."	29th May, 1856-91.
Rose, Isaac.	Superintendent Williamsburgh Canals.	4th November, 1853.
Rosa, A. P.	Superintendent Cornwall Canal.	1st to 29th April, 1875.
		1st July, 1889-91.
Rubidge, Thomas S.	Superintending Engineer, Murray Canal.	1881-86.
	See "Record of Engineers."	
Russell, Alex. J.	Superintendent, Construction Gaspe roads, Baie des Chaleurs.	
	Transferred to Crown Timber Office.	1841, June, 1846.
	Previously in Commissariat Dept., Imperial Govt.	June, 1846, to October, 1882.
	Died.	1830-41.
Shade, Absalom	Commissioner superintending expenditure Welland Canal.	12th Nov., 1887.
Sims, A. H.	Assistant Superintendent, Baie des Chaleurs road.	13th February, 1833.
	Commissioner, Gaspe roads, &c.	1843.
Simpson, George.	Superintendent, Grenville and Carillon Canals.	1846-48.
Sippell, John G.	Superintending Engineer Canals, Province Quebec, excepting River Ottawa Canals, until 1857.	18th Oct., 1889-91.
	Superintending Engineer (Consulting), Canals, Prov. Quebec.	July, 1853-77.
	Died.	22nd June, 1877-79.
	See "Record of Engineers."	26th September, 1879.
Slater, James Dyson	Superintending Engineer, Rideau Canal, &c.	
	Died.	10th June, 1858, to October, 1872.
	See "Record of Engineers."	26th October, 1876.
Smith, D. C.	Superintendent Lighthouses above Montreal.	21st June, 1855-80.
	Died.	1st May, 1880.
Snack, David	Superintending Engineer, Ottawa River Canals.	1st May, 1880.
	do do Trent River, new canals, &c.	1888-90.
	See "Record of Engineers."	
Stehalin, Captain, R. E.	Superintending Engineer, construction Grenville Canal.	1819-33.
Strong, W. O.	do do do Kingston Graving Dock.	
	Died.	1st Dec., 1888-91.
Sutherland, Hugh	Superintendent Construction Fort Frances Canal Lock.	1875-78.
Symmes, Henry R.	do St. Maurice slides, booms and other works.	24th Feb., 1858-75.
	Died.	8th October, 1875.

 SUPERINTENDENTS, &c., Principal Works, &c., Canada—*Concluded.*

Names.	Works.	Dates.
Talbot, F	Superintendent Sarnia, Brantford, Chatham and Amherst- burgh Roads	1843.
Thompson, W. H.	Superintendent (Asst.) construction Fort Frances Lock	1876-78.
Thompson, John	do Carillon and Grenville Canals	15th July, 1869, to 30th April, 1867.
Thompson, Lt.-Col., R.E.	Superintending Engineer, Rideau Canal	Date not ascertained.
Twiss, Captain, R. E.	Succeeded Major Bolton, under Imperial Govt	
Ulrich, Corneille	Superintending Engineer, Cascades, Split Rock, Trou du Moulin and Côteau du Lac Canals	1779 to 1783.
Vanderburgh, John	Superintendent Chambly Canal	1st May, 1879-85.
Vaughan, Captain A. H.	do Locks, &c., Welland Canal	1833.
	do Lake St. Peter straight channel dredging	1844-46.
	do Belle Isle lighthouse	1855-61.
	Died at Quebec	9th December, 1869.
Walton, D. S.	Superintendent Engineer, Ottawa River works	October, 1843.
Wilson, Thomas	do of works, Trent River and Newcastle Dis- tricts	1844.
Wise, Frederick Ashford Milbank	Superintending Engineer, Rideau Canal	1st Oct., 1872-91.
Woodly, J	Assistant Superintendent, Baie des Chaleurs road	1843.
Woodruff, Samuel D.	Superintendent Welland Canal	1839-71.
	do Burlington Bay Canal	1869.
Yule, Capt. Patrick, R.E.	do Construction and repairs of St. Lawrence Canals, St. Anne's Lock, &c.	1830-35.
	See "Record of Engineers."	

APPENDIX No. 21.

PUBLIC WORKS AND THEIR ENGINEERS, &c.

CANADA.

CANALS.—GRAVING DOCKS.

1779 TO 1891.

PUBLIC WORKS AND THEIR ENGINEERS, ETC.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891.

Works.	Engineers, &c.	Services.	Dates.
BAIE VERTE CANAL (Projected).			
(Marine railway, instead of canal being built, from Bay of Fundy to Baie Verte) 1887-91).			
For navigation, 4 feet.	Minnitte, Robt., P.L.S.	Survey and report to New Brunswick Govt. on Au Lac and Tidnish routes.	Oct., 1822.
Locks required, 6.	Hall, Francis, Benjamin, C.E.	Report to Govt. New Brunswick on Minnitte's survey, and on routes Shediac to Petieodiac Bend, and Shediac to Dorchester.	Oct., 1825.
Length of locks, 105½ ft.			
Breadth of locks, 20½ ft.			
Water on sills, 8 ft.			
Recommended locks.	Telford, Thomas, C.E.	Founder of the Institute of Civil Engineers, G.B., incorporated 3rd June, 1828.	
Length, 150 feet.		Report to Govt. New Brunswick, with plans, recommendations, &c.	1826.
Breadth, 40 feet.			
Water on sills, 13 feet.			
Recommends locks.	Crawley, Capt. H. O., R.E.	Survey and report, for Govt. of New Brunswick.	Jan. 19, 1843
Length, 150 ft.	do do	Report to Govt. of New Brunswick on Messrs. Hall and Telford's schemes.	Mar. 14, 1843
Breadth, 40 feet.	Page, John, Chief Engineer Public Works.	Report on previous surveys and recommends another survey.	May 7, 1869.
Water on sills, 9 feet.			
Whole-tide canal.	Baillairgé, George Fred., Asst. Chief Engineer Public Works.	Survey and report with plans and estimates to J. Page, Chief Eng. P.W.	Apr. 8, 1872.
Length, 21½ miles.			
Locks, Bay of Fundy, 4.			
Locks, Baie Verte, 2.			
Length of locks, 270 ft.	Guerin, Thomas, C.E.	Assistant to G. F. Baillairgé.	1870-73.
Breadth of locks, 40 ft.	Steckel, René, C.E.	do do	1870-73.
Water on sills, 15 ft.	Monro, Alex., P.L.S.	do do	1870-73.
	Rosa, Joseph, C.E.	do do	1870-73.
	Gzowski, Col. C. S., and Keefer, Saml. H., C.E.	Joint report on G. F. Baillairgé's report Recommend certain modifications.	May 2, 1872.
	Stark, David, C.E.	Report on supplementary survey.	Dec. 27, 1872
Half-tide canal.	Gzowski, Col. C. S., and Keefer, Saml. H., C.E.	Joint report recommending a half-tide canal through Laplanche Valley.	Feb. 18, 1873
Cost estimated at \$5,317,000.			
Half-tide, also whole-tide canal.	Baillairgé, G. F., Asst. Eng. Public Works.	Estimates, &c., for half-tide and whole-tide canals, &c.	Apr. 12, 1873

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—Continued.

Works.	Engineers, &c.	Services.	Dates.
<i>Bele Verte Canal</i> —Con.			
Estimated cost of located line, Missiguash Valley.	Baillairgé, G. F., Asst. Eng. Public Works....	Report on location survey through Missiguash Valley.....	Nov. 17, 1873
Half-tide canal, \$7,700,000			
Three-quarters-tide..... 8,100,000	Page, John, Chief Eng. Public Works.....	Report on Messrs. Keefer and Baillairgé's projects; approves latter.....	Dec. 10, 1873
Full tide..... 8,500,000			

BEAUHARNOIS CANAL (River St. Lawrence.)

Commenced, 1842.	Stevenson, Alexander....	Survey with A. Trudeau.....	1830-31.
Completed, 1845.	Trudeau, André.....	Assistant of Alex. Stevenson on survey..	1830-31.
Opens communication from Lake St. Francis to Lake St. Louis, avoiding rapids at "The Cascades," "The Cedars," and "The Côteau," River St. Lawrence.	Mills, J. B.....	Surveys and reports. North Shore Route.	1833.
	do.....	Chief Engineer. South Shore Route....	1843.
	Thompson, David.....	Assisted Mr. Mills, survey.....	1833.
	Stevenson, Alexander....	Report on canal project. South Shore..	1835.
Length, 11½ miles.	Baird, N. H.....	do do do ..	1835.
No. of locks, 9.			
Length do 200 feet.	Thompson, Henry G....	Survey of part of the River St. Lawrence above Lake St. Louis. Sept. and Dec.	1836-42.
Breadth do 45 do			
Water on sills, 9 do	Larue, Adolphe.....	Survey and Map of Lake St. Louis	1836.
Rise or lockage, 82½ feet.	Phillipotts, Lt.-Col., R.E.	Report to Imp. Gov.; on Inland Nav....	Dec. 1839.
First vessel to pass through was the "Albion," in Oct., 1845.	Killaly, Hamilton H....	Chairman, Board of Works.....	Aug. 1840.
This Canal is to be enlarged or a new one built, with a navigable depth of 14 feet of water on sills, on N. shore.	Keefer, Samuel.....	Chief Engineer, Public Works	1841-46.
	Tait, Charles Maitland..	Report, &c., on survey Beauh. Canal....	1842-43.
	Casey, Wm. R.....	do on Cedars Canal Route.....	1842.
Expenditure by Provincial Government up to 30th June, 1867, \$1,611,424.11.	Keefer, Samuel.....	Report, approving Mr. Stevenson's route—adopted	17th Feb., '42
	Shanly, Walter.....	Superintending Engineer. Construction..	1842-48.
Expenditure by Dominion Government from 1st July, 1867, to 30th June, 1889, \$124,290.47.	Kierkowski, A.....	Engineering staff. do ..	1842-45.
	Cowley, J. G.....	Assistant Sub. Engineer do ..	1843.
Total expenditure to 30th June, 1889, \$1,735,714.58.	Larocque, A. B.....	Jun. Assistant Engineer de ..	1843.
	Guy, A.....	Assistant Sub. Engineer do ..	1843.
	Stewart, James.....	Map of "Ice Shoves" at Montreal, also St. Ours' Lock and Beauharnois Canals	1843-4-5.
	Robinson, William B....	Superintendent of Canal.....	1845 to Mar., 1846.
	Macdonnell, Duncan Allan	do do	Mar., '46, to 27th Aug., 1849.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779–1891—*Continued.*

Works.	Engineers, &c.	Services.	Dates.
<i>Beauharnois Canal—Con.</i>	Stewart, James.....	Survey new works, Beauharnois, and rapids of River St. Lawrence, between Lakes St. Louis and St. Francis; also, Government property and drowned lands	1847-54. 1849-50.
	Godfrey, Thomas	Superintendent.....	1851-64. 22nd June, 1877-79.
	Baillairgé, Geo. Fred	Canal Survey and reports on claims, &c., Superintending Engineer.....	1850 to July, 1854.
	Booth, Thomas.....	Superintendent.....	1850-51.
	Legge, Charles.....	Engineering staff.....	July, 1853-77
	Sippell, John G.....	Superintending Engineer	July, 1854, to Feb., 1857.
	Booth, Thomas D.....	Superintendent.....	1853-90.
	Page, John, sen.....	Chief Engineer.....	10th Feb., '57, to 30th Apr., 1871.
	Laurencel, Pierre.....	Superintendent.....	1st May, '71, to 31st May, 1873.
	Masse, Joseph A.....	Superintendent.....	1872-76.
	Crawford, Wm.....	Surveys projected enlargement.....	1872.
	Thompson, Wm. G. McNeil	Charge of survey, Lake St. Louis.....	31st May to 6th Aug. '73
	Chaloux, François.....	Superintendent (<i>pro tem</i>).....	Aug., '73, to Apr., 1874.
	Morin, Louis.....	do	26th March, 1874-91.
	Béique, Joseph Flavien.....	do	1st May, 1875 to 1887.
	Harrington, Thos. W....	Assistant Superintending Engineer.....	12th May, 1880-91.
	Parent, E. H.....	Superintending Engineer.....	
	Sullivan, J. H.....	Resident Engineer, deepening River St. Louis and Feeder.....	1883-85.
	Doré, J. E.....	Engineering Staff	1884-86.
	Monro, Thomas.....	Examination and report, projected enlargement and North Shore Route.....	1889-90.

NEWCASTLE DISTRICT OR RIVER TRENT CANALS.

BOBCAYGEON LOCK, &c.

Part of Trent River Navigation designed to connect Bay of Quinté, Lake Ontario, with Lake Huron.*	John G. Bethune.....	Commissioners appointed to superintend Newcastle District works on the River Trent and its Tributaries.....	1833.
	Robert Brown.....		
	John Hall.....		
	Thomas Reed.....	Report, surveys, &c.....	1833.
	A. McDonell.....		
	Baird, N. H.....		
	do	Superintending Engineer.....	1833-43.
	Rubidge, F. P.....	Compiled map, Trent River, &c.....	1836.

* Distance direct, 112 miles; *via* proposed route, 235 miles; Lockage rise, 589½ ft., and fall, 243½ ft.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—*Continued.*

Works.	Engineers, &c.	Services.	Dates.
<i>Bobcaygeon Lock—Con.</i>			
Commenced, 1833.	Killaly, Hon. H. H.	Report on works prior to	1843.
Completed, 1835.	Keefer, Samuel H.	Chief Engineer.	1841-52.
Contractors, Dumble and Hoar.	Lyons, James.	Superintending Eng., R. Trent Wks., etc.	1843-55.
Contract dated 25th July, 1833.	Rigney, James.	Assistant Engineer do do ..	1843-49.
Dimensions of wooden locks, 128 x 28 x 10 feet.	Page, John, sen.	Chief Engineer, Canals, etc.	1853-90.
Replaced by stone, 1857.	Perley, H. F.	do Pub. Works.	1879-91.
Length, 134 feet.	Wilson, Thomas.	Superintendent works, Newcastle District and Trent River.	1844.
Breadth, 33 do			
Depth of water, 5 feet.	Ranney, G. W.	Superintending Engineer	4th May, '55, to July, '73.
Expenditure, Trent River Navigation, prior to 1st July, 1867, \$309,371.31.	Baillairgé, Geo. Fred.	Reports, Estimates, &c., R. Trent Works.	1863-74.
From 1st July, 1867, to 30th June, 1889, \$751,238.48.	Belcher, Thomas Deaves.	Deputy Minister, Public Works.	1879-91.
Total expenditure to 30th June, 1889, \$1,060,609.79.	Rogers, Richard B.	Superintending Engineer	1873-84.
	do	Assistant do	1878-81.
	do	do Trent Valley survey.	1882-83.
	do	Superintending Engineer	1st July, 1884-91.
	Trudeau, Toussaint.	Deputy Minister, Canals, etc.	1864-90.

BUCKHORN CANAL (River Trent).

	Baird, N. H.	Report on River Trent navigation project.	1835-36.
Overcomes rapids between Deer Bay and Buckhorn Lakes. Part of Trent River Navigation, Bay of Quinté to Lake Huron.	Belcher, Thomas Deaves.	Superintending Engineer, Trent River works.	July, 1873-84.
Commenced, 1882.	Page, John, sen.	Chief Engineer.	1881-90.
Completed, 3rd May, 1888.	Rubidge, Thos. S.	Superintending Engineer	1881-86.
Length, about $\frac{1}{2}$ mile.	Aylmer, J. A.	Resident Engineer.	June, 1882-88.
No. of locks, 1.	Clark, C.	Engineering staff.	1882-86.
Length of locks, 134 ft.	Weller, J. L.	do	1882-88.
Breadth do 33 ft.	Belcher, A. J.	do	1882-88.
Water on sills, 5 ft.	Greenwood, H.	do	1883-87.
Contract for construction signed 27th Sept., 1882.	Stark, David.	Superintending completion new works.	1887-88.
George Goodwin, contractor.			
See cost: Bobcaygeon Canal.			

BURLEIGH LOCK AND DAMS (Trent River).

Part of projected Trent River navigation, to connect Bay of Quinté, Lake Ontario, with Lake Huron.	Belcher, Thos. Deaves.	Superintending Engineer, Trent River works.	1873-84.
	Page, John, sen.	Chief Engineer.	1881-89.
	Rubidge, Thos. S.	Superintending Engineer	1881-86.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891.—*Continued.*

Works.	Engineers, &c.	Services.	Dates.
<i>Burlington Lock, &c.—Con.</i>			
Commenced, 1882.	Clarke, C.	Engineering Staff.	1882-86.
Completed, 3rd May, '88.	Weller, J. L.	do	1882-88.
Length of canal, 2½ miles.	Belcher, A. J.	do	1882-88.
No. of locks, 3.	Greenwood, H.	do	1883-87.
Dimensions, 134 x 33 x 5 feet.	Stark, David.	Superintending completion new works.	1887-88.
Left, two locks of 14 ft. and one of 6 feet.			
See cost; Bobcaygeon Canal.			
BURLINGTON BAY CANAL (Lake Ontario to Burlington Bay.) (St. Lawrence Canals.)			
Act authorising construction passed 19th March, 1823.	Clark, Hon. Thomas ..	Commissioners for superintending work, 1823.	
	Crooks, James.		
	Overfield, Manuel.		
	Chisholm, William.		
Commenced, 1825.	Wilson, John.	Contractors—Contract signed	June, 1824.
Opened, 1830.	Strowbridge, G.		
Completed, 1832.	Hayes, John W.		
Length of canal, ½ mile.	McKeen, John.		
Has no locks.	Hall, Francis Benjamin.	Superintending construction.	1825-32.
Breadth, 103 feet.	Barrett, Alfred.	Report.	1826.
Depth of water, 11 feet.	Moore, Robert, Master Mariner.	Survey, report, &c.	30 Mar., '27.
James Russell, original contractor, abandoned work.	McTaggart, John, R.E.		
Expenditure on works previous to 10th Feb., 1841, \$124,336.08; from 1841 to 1st July, 1867, \$308,328.32.	Kerr, Wm. J., C.E.	Examined works.	1824-25-26-27
Total to 1st July, 1867, \$432,664.40.	do	Secretary Board of Commissioners.	27 Feb., 1828.
Total to 1st July, 1889, \$489,523.60.	do	Superintendent of works.	1829.
Gives access to port of Hamilton and Town of Dundas, <i>via</i> Desjardins Canal.	Harris, John, Surveyor and Master Royal Navy	Report, survey and estimate and Sup.	1825-27.
	Lee, Andrew.	Superintendent of works.	on the 11th Oct., '43.
	Alchin, John.	Assistant do	do do
	Gzowski, Col. C. S.	Engineer in charge—Report.	16th Feb. '48.
	Biggar, W. F.	Superintendent.	1872-74.
	Bodwell, E. V.	do	1875.
	Page, John.	Chief Engineer of Public Works.	15 Mar., 1864 to 1879.
	do	do Canals.	1879-90.
	Ellis, William.	Superintendent, appointed.	1 Jan., 1880-91.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—*Continued.*

Works.	Engineers, &c.	Services.	Dates.
CARILLON CANAL (River Ottawa.)			
Overcomes "Carillon Rapids," Ottawa River.	Royal Staff Corps Imp.	Designed and constructed by	1819-33.
Designed, 1819.	DuVernet, Lieut.-Col. Henry	General Superintending Engineer	1819-29.
Commenced, 1826.	do do	Report to Imperial Government	26 Dec. 1827
Completed, 1833.	McKay, Wm. and Crichton, Alex.	Contractors; contract dated	17th Jan., '32
Length of canal, 2½ miles	Hall, Major	Engineering staff	1832.
Locks rising, 2.	Hayne, Capt., R.S. Corps	Supt. Construction Ottawa River Canals. 1833-34.	
do falling, 1.	Baird, N. H	Reports on works for contractors	Jan., 1833.
Length of locks, 126½ ft.	Nicolls, Gustavus, Col.	Special Report	13th July '33
Breadth do 32½ ft.	Page, John, sen.	Chief Engineer	5th May, '34.
Lockage, 34½, viz., 21½ ft. upwards and 13 ft. downwards.	Sippell, John G.	Superintending Engineer	1837-1890.
Water on sills, 6 ft.	do	Superintending Engineer, Enlargement. 1870-77.	1837-1877.
Enlargement—	do	Consulting Engineer	1877-79.
Commenced, 1871.	Coffin, Lieut.-Col. W.	Died	26 Sept., '79.
Completed, 27th May, '82	Thompson, John	General Agent, Ordnance Property	Sept., 1856.
Length of canal, ¾ mile.	Forbes, William Bilisbury	Superintendent	15 July '59 to 30 Apr., '67.
No. of locks, 2.	Harrington, Thomas W.	do (Died, 30th April, 1867)	1st May, '67.
Length do 200 ft.	Bell, Andrew	Engineering Staff	May, 1889
Breadth do 45 ft.	Thompson, E. W.	Resident Engineer	19 July, 1870
Water on sills, 9 ft.	Thompson, H. B.	Assistant Engineer, new locks and dam	July, 1872-78
Exp. prior to 1 July, 1867, Carillon and Grenville Canals, \$63,053 64.†	Bailharge, Geo. Fred.	do do	1878-85.
Exp. from 1st July, 1867, to 30th June, 1889, \$3,977,920.07.	Merrill, Horace	Superintending Engineer	22 June, '77-79.
Total cost to 30th June, 1889, \$4,040,973 71.	Parent, E. H.	Superintending Engineer, Carillon Dam.	June, '79-83.
The Str. "St. Andrew" was the first vessel that passed through this canal.	Desbarats, G. J.	Superintending Engineer	4 Feb., '79 to 1th May, '80
Ordnance canals were maintained at the expense of the Prov. Govt. since 1st Oct., 1853; their transfer from the Imp. Govt. was accepted by Order in Council, 25th Jan., 1856. Transfer ratified by Prov. Act, 19 Vic., cap. 45, 19th June, 1856.	Stark, David	Engineering Staff, canal slide and dam	Aug., 1879..
Placed under D.P.W., by O.C., 3rd March, 1857.	Marceau, Ernest	Superintending Engineer	1 May, '80-90
	George Simpson	Assistant Superintending Engineer	May, '80 91.
		Superintendent—Appointed, O.C.	18 Oct., 1889

CASCADES CANAL (River St. Lawrence.)

Overcomes the "Cascade Rapids," on the River St. Lawrence.	Twiss, Capt., R.E.	Superintending Engineer	1779 to 1783.
Designed by Gov. Haldimand.	Mann, Col. Gotter, R.E.	Report on Works to Imp. Govt., recommending enlargement	24 Dec., 1800

† Expenditure by Imp. Gov. on Carillon, Châte à Blondeau and Grenville Canals, not ascertained, records having been destroyed by fire in Montreal, in 1852.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—Continued.

Works.	Engineers, &c.	Services.	Dates.
<i>Cascades Canal—Con.</i>			
Length of 1st canal, 400 ft.	Clarke, Isaac Winslow, Dep. Commissary Gen.	Superintending Engineer	1809-22.
Commenced and completed between 1779 and 1783.			
Breadth, between 6 and 7 feet.	Bruyères, Capt., R. E.	{ Superintendent construction.....	Jan., 1804.
Water from 2 to 2½ ft.		{ Report to Imp. Govt. on progress of new canal at Cascades.....	16 Jan., 1805
Second or new Canal completed, 1804.	By, Lt.-Col., R. E.	Report on works.....	24 Apr., 1805
Length of canal, ½ mile.	Long, Major Andrew, R. E.	Superintendent Enlargement and Repairs	1817.
No. of locks, 3.	Donatti, L., Dep. Asst. Commissary General..	Superintendent.....	July, 1820.
Rise or lockage, 13½ ft.			
Length of locks, 120 ft.	King, Capt. Wm., R. E.	Superintending Engineer.	1826.
Breadth about 9½ ft.			
Depth of water (lowest) 3 feet.	Forbes, W. B., Dep. Com. Gen.	Superintendent St. Lawrence Canals ...	1830.
Enlargement of New Canal, completed, 1817.			
Breadth of locks, 12 ft.	Yule, Capt. Patrick, R. E.	Superintendent Construction and Repairs, St. Lawrence Canals.....	1830-35.
Water on sills (lowest) 3½ feet.			
The construction of the Beauharnois Canal rendered this work unnecessary for navigation of St. Lawrence.	Adams, John.....	Report on works.....	10 Sept., '35.
See Col. Gotther Mann, "Record of Engineers."	Coffin, Lieut.-Col.	General Agent, Ordnance property....	Sept., 1856-78.
	Baillairgé, Geo. Fred....	Survey and Plans of Ordnance Canals along the River St. Lawrence, with estimates of water power.....	1857.

CAUGHNAWAGA CANAL. (River St. Lawrence and Lake Champlain.)

Projected to connect Lake Champlain with River St. Lawrence, near Montreal.	Mills, J. B.	Projected canal.....	1847-48.
	Tracy, B. H.	Survey projected route, Lake St. Louis to Lake Champlain.....	1854.
Mr. Mills' project.	Jervis, J. B.	Four routes surveyed under his direction.	1854-55.
Length of Canal (including Chambly 8½) would be 32½ miles.	Gamble, S.	Report on projected canal.....	1855-56.
Locks, 200 x 45 x 9 ft.	Swift, W. H.	Consulting Engineer, recommends Mills' Route.....	1855.
Estimated cost, \$1,814,408.	(From Boston, U.S.A.)		
(See General Report Pub. Works, 67.)	Jervis, J. B.	Report on projected work do	13 Feb., 1855.
	Kingsford, Wm.	Report, in connection with Champlain Can.	1871.

CEDARS CANAL (Projected). (River St. Lawrence, North Shore.)

Mr. G. F. Baillairgé's estimated cost of Canal—"Gully Line," \$3,650,000, for 14 ft. draught of water.	Mills, J. B.	Projected canal.....	1833.
Inland Line, \$4,136,589, for 14 ft. draught of water.		(Explorations, Surveys, &c., for the projected canal between Lake St. Louis and St. Francis, were made by Messrs. Stevenson, Trudeau, Thompson, Larue, Casey, between 1833 and 1842.)	
Length—Gully Line, 13-95 miles.	Casey, Wm. R.	Plan, profile and estimate.....	1842.
Length—Inland Line, 14-20 miles.	Page, John, Sen.	Chief Engineer Public Works.....	1853-90.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—*Continued.*

Works.	Engineers, &c.	Services.	Dates.
<i>Cedars Canal—Con.</i>			
Dimensions of proposed locks, 270 x 45 x 14 ft.			
See Report G. F. Baillairgé, Assistant Chief Engineer Pub. Works, 24th August, 75. (General Report Public Works, Canada, 1867-1882, page 835.)	Baillairgé, Geo. Fred..	{ Assistant Chief Engineer Public Works } Report on projected work from survey by F. C. Farijana.....	1872-73.
	do do	Plans, profiles and estimates..	17 Sept., 1874
	do do	Estimates for a 14-foot navigation.....	24 Aug., 1875
	Farijana, F. C.....	Survey of Projected Cedars Canal.....	6 Nov., 1872, 12 April, 1873.
	Rosa, Joseph	Assistant on survey do	1872-75.
	Boulay, Phileas.....	do do do	1872-76.
		(Died 16th January, 1890.)	
	Lantier, E.....	Engineering staff, survey.	1872-73.
	Steckel, L. J. R.....	Chief Assistant to Mr. Baillairgé.....	1874-75.
	Mouro, Thomas.....	Examination, report and Location Survey	1889-90.

CHAMBLY CANAL. (River Richelieu.)

On Richelieu River, overcomes rapids between Chambly and St. John, and opens communication between the St. Lawrence and Hudson rivers, <i>via</i> Lake Champlain, Whitehall and New York and Champlain Canals.	Deane, Silas.	Observations, suggestions, &c., to Lord Dorchester <i>re</i> Canal—Lake Champlain to St. Lawrence	25 Oct., 1785
	do	Observations, &c., to Lord Sydney <i>re</i> Canal—Lake Champlain to St. Lawrence.....	26 Mar., 1787
	Lymburner, Adam	Proposed construction to Imperial Govt.	1791.
Commenced, Oct., 1831. Suspended, 1835. Resumed, 1840. Opened, 17th Nov., 1843.	Allen, Ira	Of Vermont, recommended construction to Duke of Portland.. ..	19 Mar., 1796
		(See Mr. Douglas Brynmuer, Archivist's Report.)	1889.
Length of Canal, 12 miles No. of locks, 9.	Fleming, Peter.....	Survey, plans and estimates for Commissioners.....	1830.
Length of locks, 118 to 125 ft.	Hopkins, W. R.....	Resident Engineer.....	1830-34.
Breadth of locks, 22½ to 24 ft.	Hanlon, —	Consulting do	1830-31.
Rise or lockage, 74 ft.	Melhuish, Capt., R.E....	do do	1831.
Water on sills, 7 ft.	Keefer, George	Superintending Engineer.....	1844-47.
Expenditure by Provincial Government prior to 1st July, 1867, \$634,711.76. Dominion Government, from 1st July, 1867, to 30th June, 1889, \$276,061.97. Total expenditure to 30th June, 1889, \$910,773.73.	Casey, W. R.....	Assistant do	1834.
	McRae, A. M. F.	Superintendent at St. John.....	18 Apr., '42 to 18 June, '43
	Walton, D. S.	Engineering staff, enlargement.....	1843-49.
	Phelan, Daniel.....	Superintendent (at St. John) appointed..	18 June, 1843.
Commissioners to superintend construction, appointed 1829: Samuel Hatt, W. Macrae, G. Marchand, R. Boileau and Timothée Francœur.	Robinson, Arthur G....	Assistant Engineer	1843-48.
	Blanchet, —	do	1843-49.
	Redpath, Peter.....	Superintendent of Works (at St. John) ..	Prior to 1844
	Baillairgé, Geo. Fred....	Superintending Engineer.....	1877-79.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—Continued.

Works.	Engineers, &c.	Services.	Dates.
<i>Chaudière Canal—Con.</i>			
	Baillairgé, Geo. Fred....	Surveys of Canal and drowned lands ...	1849-50.
	Kildy, Daniel.....	Superintendent and Paymaster.....	1843-47.
	Borne, Michael.....	Superintendent.....	31 May, 1843-53.
	McDonald, J. Frobisher.	Superintending Engineer.....	1848-52.
	Bonacina, —.....	Superintendent (<i>pro tem</i>).....	1853-54.
	Sippell, John G.....	Superintending Engineer.....	1853-77.
	Chartier, P. Telesphore..	Superintendent... ..	1854-63.
	Page, John, Sen	Chief Engineer.....	1853-90.
	Préfontaine, Christophe.	Superintendent... ..	15 Oct., 1863-77.
	Harrington, Thos. W ...	Assistant Engineer.....	1 Oct., 1870-75.
	do do ... do	Superintending Engineer.....	1 May, 1875-87.
	Quimet, Louis.....	Superintendent.	1877-79.
	Ulric, Cornéille.	Superintendent.....	1 May, 1879-85.
	Parent, E. H.....	Superintending Engineer.....	12 May, 1880-91.
	Papineau, L. G.....	Engineering staff	1881-83.
	Benoit, Pierre Basile....	Superintendent.....	1886-88.

CHATS CANAL (Upper Ottawa).

Designed to avoid the "Rapide des Chats," and as a link in navigation of Ottawa River from Montreal to Lake Huron.	Gallwey, W. B.....	Preliminary survey, Lake des Chats Canal	1852-54.
Commenced, August, 1854	Perry, Capt. George H..	Survey, &c.....	1853-58.
Work suspended 15th November, 1856.	Norman, Thomas E....	Engineering staff.....	1853.
Dimensions of proposed locks, 190 x 45 x 7 ft.	Page, John, sen	Chief Engineer... ..	1853-90.
Total lockage, 49-80 ft.	do	Report	30th March, 1854.
Expenditure to 1856, \$482,950 81.	McDonald, A. P.....	Contractors, commenced work	Aug., 1854.
	Schram, F.....		

CHISHOLM'S RAPIDS, LOCK, &c. (Trent River).

Commenced, 1837.	Baird, N. H.....	Report on project	1833-36.
Completed, 1844.	Rubidge, F. P.....	Compiled map Trent River.....	1836.
Length of canal, 3,060 ft.	Baird, N. H	Superintending Engineer.....	1837-41.
do lock, 133½ ft.			
Breadth of do 32½ ft.	Keefer, Samuel.....	Chief Engineer.....	1841-52.
Water on sills, 5 ft.			
No. of locks, 1.			

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—Continued.

Works.	Engineers, &c.	Services.	Dates.
<i>Chisholm's Rapids, Lock, &c.</i> —Continued.			
Part of "Trent River Navigation," to connect Bay of Quinté, Lake Ontario, with Lake Huron.	do	Special Report.	1846.
Total lockage required : Rise, 589½ feet. Fall, 243½ do	Killaly, Hon. H. H.	Report on works prior to	1843.
832½ do	Lyons, James	Superintending Engineer	1843-55.
Distance direct, 112 miles do proposed line, 235 miles.	Rigney, James	Assistant Engineer	1843-49.
For cost, <i>see</i> "Bobcaygeon Canal."	Page, John, sen	Chief Engineer	1853-90.
	Ranney, G. W.	Superintending Engineer	4th May, '55, to July, '73.
	Baillairgé, George Fred.	Assistant Chief Engineer	1877-79.
	Belcher, Thomas Deaves,	Superintending Engineer	1873-84.
	Rogers, Richard B.	Assistant do	1878-81.
	do	do do survey	1882-83.
	do	Superintending do	1st July, '84-91.

CHUTE A BLONDEAU CANAL (River Ottawa).

Constructed to avoid "Chute à Blondeau" Rapids.	Royal Staff Corps	Designed and constructed by	1819-33.
Designed, 1819.	Du Vernet, Lt.-Cl.	Henry General Superintending Engineer	1819-29.
Commenced, 1826.	do	Report to Imperial Government	26th Dec., 1827.
Completed, 1832.	Hayne, Capt., R.S. Corps	Supt. construction, Ottawa River Canals.	1833-34.
Length of canal, ¼ mile.	Page, John, sen	Chief Engineer	1857-90.
No. of locks, 1.	Thompson, John	Superintendent	1859-67.
Length of locks, 130½ ft.	Sippell, John G.	Superintending Engineer	1857-77.
Breadth do 32½ ft.	Coffin, Lieut.-Col. W	General Agent, Ordnance property.	Sept., 1856.
Water on sills, 6 ft.	Sippell, John G.	Consulting Engineer	1877-79.
Rise or lockage, 3½ ft.	Forbes, W. B.	Superintendent	1867-89.
Placed under control Department Pub. Works, Canada, 3rd Mar., 1857	Harrington, Thomas M.	Engineering staff	19th July, 1870.
Construction of Carillon Dam has obviated use of this canal. <i>See</i> General Report Pub. Works by G. F. B., 1867 to 1872, page 815.	Baillairgé, George F.	Superintending Engineer	22nd June, 1877-79.
The steamer "St. Andrew" was the first vessel that passed through the first canal.	Parent, E. H.	Resident Engineer	4th Feb., '79.
	Stark, David	Superintending Engineer	1st May, '80-90.
	Marceau Ernest,	Assistant Engineer	May, 1880-89.

CORNWALL CANAL (River St. Lawrence.)

Enables vessels to avoid "Long Saut Rapids."	Gourlay, Robert	Views respecting proposed canal.	1819.
Sir John Beverley Robinson cut first sod, 1834.	Clowes, Samuel	Report and estimate	1826.
Opened December, 1842.	Barrett, Alfred	Report, &c.	1830.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—Continued.

Works.	Engineers, &c.	Services.	Dates.
<i>Cornwall Canal—Con.</i>			
Completed 10th April, 1843.	Wright, Benjamin	Consulting Engineer	1833.
Length of canal, 11½ miles.	Mills, J. B.	Chief Engineer	1833-48.
No. of locks, 6.	Cole, Capt., R.E.	Consulting Engineer	1833.
Length of locks, 4 of 200 ft. and 2 of 270 ft.	Fleming, Peter	do	1834.
Breadth do 45 ft.	Geddes, —	do	1834.
Rise or lockage, 48 ft.	Keefe, George	Resident Engineer, Lower Division, first construction	1834-43.
Water on sills, 9 ft.	Killaly, John S.	Engineering staff	1834-43.
The steamer "Highlander" was the first vessel that used the canal, in Nov., 1842.	Phillipotts, Lt. Col., R.E.	Engineer in charge of construction	1836.
This canal is being deepened to a navigable depth of 14 feet with locks of 270 x 45, since 1876.	Killaly, Hon. Hamilton H.	Chairman, Board of Works	20 Dec., 1841-46.
	McDonald, J. Frobisher.	Engineer, &c., Survey and Plan of Canal	1842-43.
	Rigney, James	Superintending Engineer	11, Oct. 1843.
	Godfrey, Thomas	Superintendent	1843-49.
	Legge, Charles	Engineering staff	1846-54.
Expenditure prior to 1st July, 37, \$1,933,152.69;	McDonell, Duncan Allan	Superintendent	27 Aug., '49.
Expenditure from 1st July, 1867, to 30th June, 1889, \$1,056,135.84;		(Resigned 1st July, 1889.)	
Total expenditure to 30th June, 1889, \$2,989,288.53.	Page, John, sen.	Chief Engineer	1853-1890.
	Baillairgé, Geo. Fred.	Superintending construction of weirs, &c.	1856-70.
	Rubidge, Thos. S.	Superintending Engineer, enlargement	1876-91.
	Page, John, jun.	Assistant Engineer	1880-85.
	Killaly, H. H., jun.	Resident Engineer, enlargement, upper half	1 July, 1885-91.
	Rhéaume, L. N.	Engineering staff, enlargement, upper half	1 July, 1885-91.
	Robertson, G. E.	do do lower half	1 July, 1885-91.
	Weller, J. L.	do do do	Aug., 88-91.
	Ross, A. P.	Superintendent	1 July, 1889-91.
COTEAU DU LAC CANAL (River St. Lawrence.)			
To avoid "Côteau du Lac Rapids."	Royal Staff Corps, Imperial	Designed and constructed by.	
Length of canal, 900 ft.	Twiss, Capt., R.E.	Superintending Engineer	1779-83.
No. of locks, 2.	Mann, Col. Gother, R.E.	Report on works	24 Dec., 1890.
Commenced and completed between 1779 and 1783.	By, Lt. Col., R.E.	do	24 Apl., 1805.
	Bruyères, Capt., R.E.	Report on progress new canal at Cascades	16 Jan., 1805.
Breadth of locks, 6 to 7 ft.	Clarke, Isaac Winslow, Deps Com. General.	Superintending Engineer	1809-1822.
Depth of water, 2 to 2½ ft.	Long, Major Andrew, R.E.	Construction and repairs	1817.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—Continued.

Works.	Engineers, &c.	Services.	Dates.
<i>Côteau de Lac Canal</i> —Continued.			
1st enlargement, 1804.	Donatti, L., Asst. Commissary General.....	Superintendent.....	July, 1820.
Length of locks, 120 ft.	King, Capt. William, R.E.....	Superintending Engineer.....	1826.
Breadth, about 9½ ft.			
Depth water on sills, 3 ft.	Forbes, W. B., Deputy Commissary General..	Superintendent, St. Lawrence Canals....	1830.
2nd enlargement, 1817.	Yule, Capt. Patrick, R.E.	Superintendent, construction and repairs, St. Lawrence Canals.....	1830-35.
Length of locks, 120 ft.			
Breadth do 12 ft.	Evatt, H. B.....	Superintendent of Locks.....	1832.
Water on sills (lowest), 3½ ft.			
This canal has not been used for purposes of navigation, since the Beauharnois Canal was constructed. <i>Vide</i> Col. Gother Mann, "Record of Engineers."	Brandson, Mr.....	Contractor.....	1832.
	Adams, John.....	Superintendent of Locks.....	15 Nov., 1853
	Page, John, sen.....	Chief Engineer.....	1853-90.
	Coffin, Lt. Col. W.....	General Agent, Ordnance property.....	Sept., 1856-78.
	Baillairgé, Geo. Fred....	Survey and plans of Ordnance canals, along the River St. Lawrence with estimates of works to utilize water power at each.....	1857.

CROOK'S RAPIDS, NOW HASTINGS (Trent River.)

Lock, &c.	Baird, N. H.....	Report of project.....	Nov., 1833.
A part of the Trent River navigation, designed to connect Bay of Quinté, Lake Ontario, with Lake Huron. Distance direct, 112 miles; <i>via</i> projected route, 235 miles.	do.....	do.....	1835-36.
	do.....	Superintending Engineer.....	1837-41.
Lockage rise, 589½ feet.	Rubidge, F. R.....	Compiled map of Trent River.....	1836.
Fall, 243½ do	Killaly, Hon. H. H.....	Report, prior to.....	1843.
Total, 832½ do	Keefer, Samuel.....	Chief Engineer.....	1841-52.
Commenced, 1837.	Rigney, James.....	Assistant Engineer.....	1843-49.
Completed, 1844.	Lyons, James.....	Superintending do.....	1843-55.
Length of lock, 134 ft.	Keefer, Samuel.....	Special report.....	1846.
	Page, John, sen.....	Chief Engineer Canals, &c.....	1853-80.
Breadth do 33 ft.	Ranney, G. W.....	Superintending Engineer.....	1855-73.
Water on sills, 5 ft.	Baillairgé, G. F.....	Reports and Estimates on Trent River navigation.....	1863-74.
For cost, Trent River Navigation improvements, <i>see</i> Bobcaygeon Canal.	Belcher, Thomas D.....	Superintending Engineer.....	July, 1873-1884.
	Rogers, Richard B.....	Assistant Superintending Engineer.....	1878-81.
	Percy, Henry F.....	Chief Engineer, Public Works.....	Nov., 1880-91.
	Rogers, Richard B.....	Survey, Trent Valley District.....	1882-83.
	do.....	Superintending Engineer.....	1st July, 1884-91.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779–1891—Continued.

Works.	Engineers, etc.	Services.	Dates.
CULBUTE CANAL (Upper Ottawa.)			
108 miles above Ottawa City. Overcomes Little Rapids; opens communication from Bryson to Aberdeen, a distance of 70 miles.	Page, John sen.	Chief Engineer.....	1872-90.
Commenced, 1873.	Sippell, John G.	Superintending Engineer.....	1873-77.
Completed, 1876.	do	Consulting	1877-79.
Length of canal, $\frac{1}{2}$ mile.	Perry, Capt. G. H.	Resident	1873-87.
No. of locks combined, 2.	Thompson, H. B.	Assist. Resident	Sept., 1873-78.
Material, wood.	Hamel, Amédée.....	Engineering staff.....	Aug., 1874.
Length of locks, 200 ft.	Hamel, Félix M.	do	do 1874.
Breadth do 45 ft.	Harrington, Thos. W.	Assistant Engineer.....	1873-80.
Rise or lockage, low water, 14 ft.	do	Assistant Superintending Engineer.....	1st May, 1873-87.
Rise or lockage, high water, 18 ft.	Baillairgé, G. F.	Superintending	1877-78.
Water on sills (lowest) 6 ft.	Parent, E. H.	do	4th Feb., 79, to 1st May, 1880.
A link of projected navigation, Montreal and Lake Huron, via River Ottawa.	Stark, David.....	Superintending Engineer.....	1st May, 1880-90.
See Ottawa and Lake Huron projected canals, and General Report Pub. Works 1867-82 Page 828.			
Total expenditure from 1st July, 1867, to 30th June, 1889, \$413,717.48.			

DESJARDINS CANAL (Burlington Bay.)

Prolongs navigation from Burlington Bay via "Coot's Paradise," to town of Dundas.	Desjardins, P.	Obtained Act of incorporation for construction	30th Jan., 1826.
Opened 16th Aug., 1837.	Baldwin, Robert.....	Was chosen as Director of the Desjardins Canal, in place of P. Desjardins, deceased, Nov. 1827.	
Dimensions, originally—	Stewart, James.....	Report on condition of works, &c	3rd Feb., 1849.
Length of canal, 3.68 miles.			
No locks.			
Breadth 33 ft.			
Depth of water, originally $7\frac{1}{2}$ ft.			
Cost \$98,684, of which Government advanced \$68,000 prior to 1837.		(See general report on Public Works, 1867 by G. F. Baillairgé, pages 573-574.)	
Total cost to 30 June 1867.			
Govt. funds, —			
loan .. \$120,263 93			
Other than Gov't funds, loan 30,684 00			
\$150,947 93			
John Patterson, President of Company, and John Dickie, Secretary, 1841.			

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—*Continued.*

Works.	Engineers, etc.	Services.	Dates.
FARRAN'S POINT CANAL. (River St. Lawrence.)			
River St. Lawrence (one of the Williamsburgh Canals).	Clowes, Samuel.....	Report and estimate.....	1826.
	Barrett, Alfred.....	do.....	1830.
Commenced, 1844.	Forbes, W. B., Dep. Com. Genl.....	Superintendent, St. Lawrence Canals.....	1830, to 15th June, 1847.
Opened, June, 1847.			
Completed, 1848.	Mills, J. B.....	Surveys, reports and superintending construction.....	1833-47.
Length of canal, $\frac{3}{4}$ mile.			
No. of locks, 1.	Phillipotts, Lt.-Col., R.E.	Report to Imperial Government.....	1839-40.
Length of lock, 200 ft.			
Breadth do 45 ft.	Keefer, Samuel.....	Chief Engineer.....	1841-52.
Water on sill (ordinary) 9 ft.			
Rise or lockage, 4 ft.	Baillairgé, G. F.....	Resident Superintending Engineer.....	1853-56.
This canal is to be deepened to a navigable depth of 14 feet, with a lock of 270 x 45 ft. and 14 ft. water on sills.	Rose, Isaac.....	Superintendent, Williamsburgh Canals..	4th Nov., '53, to 26th Apr., 1875.
For cost of construction, See Williamsburgh Canals.	Page, John, sen.....	Chief Engineer.....	1853-90.
	Macdonell, Alex. Greenfield.....	Superintendent.....	26th April, 1875-89.
		Died.....	27 Jan., '90.
	Rubidge, Thomas, S....	Superintending Engineer, enlargement..	1890.
	Killaly, H. H., jun.....	Resident do.....	Dec., 1894-88.
	Reid, John.....	Superintendent.....	18th Oct., '89.
		Died.....	13th May, '90.
	Reid, John D.....	Acting Superintendent.....	1st May, '90.
FENELON FALLS CANAL, &c. (River Trent.)			
Part of Trent River navigation to connect Bay of Quinté, Lake Ontario, with Lake Huron.	Page, John, sen.....	Chief Engineer, Railways and Canals ..	1880-90.
	Rubidge, Thos. S.....	Superintending Engineer.....	1881-86.
	Clark, C.....	Engineering staff.....	1882-86.
Commenced, 16th Oct., 1882.	Weller, J. L.....	do.....	July, 1882-88.
Completed, 22nd Oct., 1885.	Greenwood, H.....	do.....	1883-87.
Length of canal, $\frac{1}{4}$ mile.			
Length of locks, 134 ft.	Stark, David.....	Superintending completion of works.....	1887-90.
Breadth do 33 ft.			
Water on sills, 5 ft.			
Two lift locks.			
This canal connects Sturgeon Lake with Cameron Lake.			
For cost, Trent River Navigation, See "Bobcaygeon Canal."			

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—Continued.

Works.	Engineers, etc.	Services.	Dates.
FORT FRANCES LOCK, &c. (River Lapluie, Dawson Route.)			
Projected to permit navigation from Kettle Falls, Rainy Lake, to Lake of the Woods, 164 miles.	Page, John, sen.	Chief Engineer, Public Works.	1853-79.
Commenced, 1st July, 1875.	do	Prepared plan of lock	1876.
Completed except lock gates, 1878.	Fleming, Sanford.	Consulting Engineer.	1875.
Cost up to 22nd Jan., 1879, \$288,278.51.	Hazlewood, Sam.	Survey, report, &c.	1875.
Length of canal, 800 ft.	do	Superintending Engineer.	1875-78.
do lock, 200 ft.	Sutherland, Hugh.	Resident Engineer and Superintendent of Works	11th May, 1875-78.
Breadth of do 36½ ft.	Mortimer, Henry J.	Profile, selected location, &c.	1875.
Water on sill (lowest) 7 ft.	do	Assistant Engineer.	1875-78.
	Cuddy, E. C.	Plans of Fort Frances.	1875.
	Thompson, W. H.	Asst. Resident Engineer and Superintendent of Works.	1875-79.
	Baillairgé, Geo. Fred.	Plan of lock and gates modified, and work laid out accordingly.	Aug.-Sept., 1876.

GALOPS CANAL (One of the Williamsburgh Canals.)—River St. Lawrence.

Overcomes the "Galops Rapids," River St. Lawrence.	Clowes, Samuel.	Submitted report and estimate.	1826.
Commenced, 1844.	Wright, Benjamin	Survey and report.	1833.
Completed, Nov., 1846.	Killaly, Hamilton H.	Chairman Board of Works.	1841.
Length of canal, 2½ miles.	Mills, J. B.	Surveys, reports, &c.	1833 to 1843.
No. of locks, 2.	do	Superintending Engineer.	1843 to 15th June, 1847
Length of locks, 200 feet.	Phillipotts, Lt.-Col. R.E.	Approved plans, &c.	1843.
Breadth do 45 do			
Left do 8 do			
The "Galops" and "Iroquois" Canals were connected by the "Junction." The three are now known as the "Galops Canal."	Rose, Isaac.	Superintendent.	4th Nov., '53, to 26th April, '75.
	Page, John, sen.	Chief Engineer.	1853-90.
	Macdonell, Alexander Greenfield.	Special report.	1880.
		Superintendent Williamsburgh Canals.	26th April, 1875-89.
Length of canal, 7½ miles.		Died.	27th Jan., '89
No. of locks, 3.	Rubidge, Thos. S.	Superintending Engineer, deepening rapids.	1875-82.
Length of locks, 200 feet.			
Breadth do 45 do			
Water on sills 9 do			
Rise or lockage 15½ do	Haycock, Sam. H.	Engineering staff, enlargement.	Aug., 1879.
	Reid, John.	Superintendent—Appointed.	18th Oct., '89
		Died.	13th May, '90
	Reid, John D.	Acting Superintendent.	1st May '90

NOTE.—This Canal is being deepened to a navigable depth of 14 feet with locks of 270 x 45 ft.

9—5½***

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—*Continued.*

Works.	Engineers, etc.	Services.	Dates.
<i>Galops Canal—Con.</i>			
"Junction" commenced, 1851.	John Page.....	Resident, Superintending Engineer.....	1850-53.
"Junction" completed, 1856.	G. F. Baillairgé.....	do do	1853-56.
For cost of construction, See "Williamsburgh Canals."			

GEORGIAN BAY CANAL (Lake Ontario to Lake Huron.)

Projected.	Tully, Kivas.....	Proposed canal, Lake Ontario to Lake Huron	1845-51.
See Ottawa and Lake Huron projected canals, General Report of Public Works Department, 1867 to 1882, page 844.	West, James.....	Proposed Georgian Bay, Lake Huron and Ottawa Canal.. ..	23rd Feb., 1856.
	Monro, Thomas.....	In charge of summer level survey, projected canal.....	1857.
	Keefer, Thomas.....	Report on project.....	1863.

GRENVILLE CANAL (River Ottawa.)

Carries navigation round "Long Saut Rapids," Ottawa River.	Mann, Col. Gother, R.E.	Consulting Engineer, Ordnance Canals..	1819-33.
Commenced, summer 1819.	Stehelin, Capt., R.E....	Asist. General Superintending Engineer, construction.....	1819-33.
Durham boats passed 1st August, 1832.	Mann, Capt. J. W., R.E.	Engineer in charge of construction.....	1819.
Completed, 1833.	DuVernet, Lt.-Col., R.E.	General Superintending Engineer.....	1819-33.
Length of canal, 5 $\frac{1}{2}$ miles.	do do ..	Report on works to Imperial Government ..	20th Nov., 1820.
No. of locks, 7.	Read, Capt. J. M.	Asst. Engineer in charge construction. .	1824.
Locks varied in length from 107 to 130 $\frac{1}{2}$, and in breadth from 19 to 32 $\frac{1}{2}$ ft., with 6 ft. of water on sills.	King, Capt. Wm., R.E..	Superintending Engineer.....	1825.
	By, Lt.-Col.	Letter to General Mann, recommending enlargement.....	13th July, 1826.
Enlargement commenced, 1871.	Smyth, Major General Sir J. Carmichael.....	Report to General Mann adverse to enlargement.....	1826.
Completed, 27th May, 1882.	Hayne, Capt., R.S. Corps	Superintending construction Ottawa River Canals.....	1833-34.
Length new works, 5 $\frac{1}{2}$ miles.	Hadden, Lieut., R.E....	Engineering staff.....	1834.
No. of locks, 5.	Hayes, Capt., R.S. Corps.	do	1834.
Length of locks, 200 feet.	Howorth, Lieut., R.E...	do	1836.
Breadth do 45 do	Vavasour, Lieut., R.E...	do	1840.
Water on sills 9 do			
Rise or lockage 45 $\frac{1}{2}$ do			
For cost of works, See Carillon Canal.	White, Lieut., R.E.....	do	1844.
Ordnance canals were maintained at the expense of the Provincial Government since 1st	Gordon, Lieut., R.E...	do	1844.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—Continued.

Works.	Engineers, etc.	Services.	Dates.
<i>Greenville Canal—Con.</i>			
October, 1853. Their transfer from the Imperial Government was accepted by Order in Council 25th January, 1856. Transfer ratified by Provincial Act, 19 vic. cap. 45, 19th June, 1856. The steamer "St. Andrew" was the first craft that passed through this canal, when it was first constructed.	Ford, Capt. Chas. E., R.E.	Superintendent of works.....	1846.
	Page, John, sen.....	Chief Engineer, Public Works, &c., Canada	1853-1890.
	Thompson, John.....	Superintendent.....	15th July, '59, to 30th April, '67.
	Forbes, William Bilsbury	do	1st May, '67, to May, '89
		Died.....	29th May, '89
	Sippell, John G.....	Superintending Engineer.....	1857-77.
		Consulting do	1877-79.
	Bell, Andrew.....	Assistant Engineer.	1871-85.
	Deniel, Emile.....	Assistant Engineer, enlargement.....	Sept., 1872, to 1887.
	Parent, E. H.....	Resident Engineer.....	July, 1872-78
		Superintending Engineer.....	4th Feb., '79, to 1st May, 1880.
	Baillairgé, Geo. Fred....	Superintending Engineer.. ..	1877-79.
	Languelec, G. de G.....	Engineering staff.....	May, 1879-87
	Stark, David	Superintending Engineer.....	1st May, 1880-90.
	Marceau, Ernest.....	Assistant Superintending Engineer	May, '80-'90.
	Simpson, George.....	Superintendent—Appointed, O.C	18th Oct., '89

IROQUOIS POINT CANAL (River St. Lawrence.)

River St. Lawrence. One of the Williamsburgh Canals. Overcomes Rapids at Iroquois Point. Commenced, 1844. Completed, Sept., 1847. Length of lock, 200 ft. Breadth do 45 ft. Water on sills, 9 ft. Lift of lock, 3½ ft.	Clowes, Samuel	Submitted report and estimate	1826.
	Wright, Benjamin	Survey and report.....	1833.
	Killaly, Hon. H. H.	Chairman, Board of Works	1841.
		Reports, surveys, &c	1833-43.
The "Iroquois Point" and "Galops" Canals were in 1851-56, joined, by the Junction Canal. The three are now known as the Galops Canal; its dimensions are—	Mills, J. B	Superintending Engineer.....	1843 to June 15, 1847.
	Phillipotts, Lt.-Col., R.E.	Report approving plans, &c.	1843
Length of Canal, 7½ miles No. of locks, 3. Length of locks, 200 ft. Breadth do 45 ft. Water on sills, 9 ft. Rise or lockage, 15½ ft. For cost of construction, See "Williamsburgh Canal."			

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—*Continued.*

Works.	Engineers, etc.	Services.	Dates.
JUNCTION CANAL (River St. Lawrence.)			
One of the Williamsburgh Canals, about 2 mls long. Connects the Iroquois and Galops Canals on the River St. Lawrence. Commenced, 1851. Completed, 1856.	Page, John, sen.	Resident Superintending Engineer.	1850-53.
	do	Chief Engineer, Public Works	1853-80.
	do	do Canals	1880-90.
Those three Canals are now known as the Galops Canal.	Baillairgé, G. F.	Resident Superintending Engineer.	1853-56.
Length of Canal, 7½ miles.	Rose, Isaac.	Superintendent	4 Nov., 1833 to 26 April, 1875.
No. of locks, 3.	Macdonnel, Alex. Greenfield.	Superintendent	Apr. 26, 1875-89.
Length of locks, 200 ft.			
Breadth do 45 ft.		Died	27th Jan., '89
Water on sills, 9 ft.			
Rise or lockage, 15½ ft.			
This canal is being deepened to a navigable depth of 14 ft. with locks of 270 x 45 ft.	Rubidge, Thomas S.	Superintending Engineer, enlargement.	1880.
	Reid, John	Superintendent, appointed	18 Oct., '89.
		Died	13 May, '90.
	Reid, John D.	Acting Superintendent	1 May, '90.

LACHINE CANAL (River St. Lawrence.)

Overcomes Lachine or Saint-St-Louis Rapids, River St. Lawrence.	Lymburner, Mr.	Proposed canal, Montreal to Lachine.	1791.	Im \$400
		(See Mr. Byrner, archivist's report, 1889)		
Commenced, 17th July, 1821. Opened in 1824.	Prevost, Sir George	Bill providing for construction introduced in Assembly by M. P. for Montreal.	Dec., 1732.	by P ment ily, 180
Completed in 1825.		Recommended construction.	1815.	
Length of canal, 8 miles 718 yards.	Burnett, Thomas.	Survey and plan	Spring, 1821-26.	are, 1st to 30th
No. of locks, 7.	McDowall, Robert	Superintending Engineer	1821.	\$6,633,681.2
Length of locks, 100 ft.		Assistant Superintendent of work.		
Breadth " 20 ft.	Gibbs, Alexander.	Assistant Superintendent do	1st Ju	1880, 89, 221
Water on sills 5 ft.	Finlay, John, Dep. Com. General.	Superintending Engineer (construction).	1823-	
Cost until 1826, \$438,404.15.	Adams, John.	Superintendent.	5th	
1st Enlargement.	Burnett, Thomas.	Superintendent.	182	
Commenced, 1843.	Burnett, John.	Superintendent.	18	
Completed, 1849.	Forbes, — Dep. Com. Gen.	Superintendent St. Lawrence Canals	18	
Length of canal, 8½ miles				
locks, 200 ft.	Barrett, Alfred.	Report on 1st enlargement	18	
Breadth " 45 ft.				
Rise or lockage, 44½ ft.	Rubidge, F. P.	Assistant Chief Engineer.	18	
No. of locks, 5.				
Water on sills at two lower locks, 16 feet.	Hindmarsh, J.	Superintendent.	184	
Water on sills at 3 locks, 9 feet.	Cornell, John.	Engineering staff, enlargement.	184	
Old locks are used as weirs.	Robinson, Arthur G.	Assistant Engineer.	184	
	Walton, D. S.	Engineering staff, enlargement.	184	

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—Continued.

Works.	Engineers, etc.	Services.	Dates.
<i>Lachine Canal—Con.</i>			
2nd Enlargement.	Carmichael, Daniel	Superintendent	1844-46.
Length of canal, $8\frac{1}{2}$ miles	Wells, Arthur	Engineering staff, enlargement	1846.
" new locks, 270 ft			
Breadth " 45 ft			
Watson sills 3 upper, 14 ft	Dunlop, —	Superintendent	1846-49
" " 2 lower, 18 ft			
No. of locks, 5.	Kingsford, Wm	Survey, map and description	1847.
Rise or lockage, 45 ft.			
Works commenced, 1873.	Stewart, James	Survey new works	1847-54.
" completed, 1884.			
Commissioners appoint'd, 1823 :—	McDonald, J. Frobisher	Superintending Engineer	1848-52.
Richardson, John—Chair- man.	Bussett, Alexander	Superintendent	1849 to Jan., 1868.
Grant, C. W.	Sippell, John G	Superintending Engineer	1853-77.
Porteous, T.		Superintending Engineer, enlargement	1870-77.
Garden, Geo.		Consulting Engineer do	1877-79.
Ross, David.	G. F. Baillairge	Superintending Engineer do	1877-79.
Desrivieres, Francois.			
Commissioners to provide for care and manage- ment of Lachine Canal, January, 1831 :—	Page, John, senr	Chief Engineer	1853-90.
John Richardson.		Special report	1880
C. W. Grant.	Conway, Michael	Superintendent and Assistant Engineer	Apr., 1868-90
T. Pothier.	Harrington, Thos. W.	Engineering staff	July 18, 1870
Expenditure by Imperial Government, \$40,600.00	do	Assistant Superintending Engineer	1st Oct., 1875- 87.
Expenditure by Provin- cial Government prior to 1st July, 1867, \$2, 845,532.85.	Conway, John	Engineering staff, enlargement	1871-83.
Expenditure, 1st July, 1867, to 30th June, 1889, \$6,633,631.87.		Engineer, electric light apparatus	1886-91.
Total Expenditure to 30th June, 1889, \$9,221,214.72			
	Joslin, H. K	Resident Engineer, Montreal Division, 2nd enlargement	July, 1872-82
	Sutcliffe, John	Engineering staff, enlargement	15th July, 1872-86
	Thompson, H. B.	do do	Dec., 1872.
	Aylmer, J. A.	do do	1873-79.
	Bellingham, A	Assistant Resident Engineer, 2nd en- largement, Upper Division	1873-78.
	Mooney, Wm	Engineering Staff, enlargement, Mon- treal Division	1873
	Robertson, G. E	Engineering Staff, Lower Division, 2nd enlargement	1873-85
	Leprohon, C. de B	Engineering Staff, enlargement, Lachine Division	1873-85
	Page, John, junr.	Engineering Staff, enlargement	April, 1876- 79
	Marceau, Ernest	do do	July, 1876-77
	Killaly, H. H., junr.	Resident Engineer, Upper Division, 2nd enlargement	Feb., 1876-85
	Rosmond, Joseph A.	Engineering Staff, enlargement	1876-82.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—*Continued.*

Works.	Engineers etc.	Services.	Dates.
<i>Lachine Canal—Con.</i>			
	Boulay, Philéas.....	Assistant Engineer, enlargement.....	1877-80.
	Rhéaume, L. N.....	Assistant Engineer, enlargement.....	1877-81.
	Henry, Geo. W.....	Enlargement Lachine Canal.....	1880-85.
	Parent, E. H.	Superintending Engineer.....	12th Mar. 1880-91.
	Duchsneau, A.....	Superintending Engineer's Office, Mont- real. Eng. Staff and draughtsman.....	1872-91.
	Sutcliffe, John.....	Engineering staff, enlargement St. Gabriel's Basin.....	1882-86.
	Doré, J. E.....	Engineering staff.....	1884-85.

LINDSAY LOCK &c. (Lake Scugog).

Part of projected Trent River navigation—Bay of Quinte—Lake Ontario, to Lake Huron—	Baird, N. H.....	Report on Lake Scugog, &c.....	1835
	do	Superintending Engineer.....	1837-41
	Killaly, Hon. H. H.....	Report prior to.....	1843
Commenced, 1837. Completed, 1844.	Keefer, Samuel.....	Chief Engineer.....	1841-52
	Lyons, James.....	Superintending Engineer.....	1843-55.
Length of canal, 345 feet. do lock, 134 do	Rigney, James.....	Assistant Engineer.....	1843-49
Breadth of do 34 do			
Water on sills, 5 do	Ranney, G. W.....	Superintending Engineer.....	4 Mar. 1850 to July, 73
Lift of lock, 8 do			
Converted into a slide in 1859.	Page, John, sen.....	Chief Engineer.....	1853-90
Rebuilt in 1870 by Govt. of Ontario, who control it.	Baillairgé, Geo. Fred....	Assistant Chief Engineer Reports and Estimates, Trent River Works.....	1867-74
For cost, Trent River Navigation, &c. "Bob- caygeon Canal."	Belcher, Thos. Deaves...	Superintending Engineer.....	July 1881
	Rogers, Richard B.....	Assistant Engineer.....	1878-8
	do	Survey, Trent Valley Canals.....	1882-83
	do	Superintending Engineer.....	July, 1884

MILL RAPIDS CANAL (Cascades Point, River St. Lawrence.)

Not in use for purposes of navigation since con- struction of Beauhar- nois Canal.	Royal Staff Corps.....	Imperial Government work. (Designed by Governor Haldimand).....	1779-83
	Twiss, Capt. R. E.....	Superintending Engineer.....	1779-83.
Commenced and com- pleted between 1779 and 1783.	Mann, Col. Gother, com- manding R. E.....	Report recommending enlargement.....	24 Dec. 18
Material—stone.			
Breadth of lock, 6 feet.	By, Lt-Col., R. E.....	Report on works.....	24 Apr., 18
Lock rebuilt, 1804.	Clarke, Isaac Winslow,		
Length, 120 feet.	Depy. Com'y-Genl....	Superintendent.....	1809-22
Breadth, 9½ do			
Water, 3½ do			

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—Continued.

Works.	Engineers, etc.	Services.	Dates.
<i>Mill Rapids Canal—Con.</i>			
"Mill Rapids" and "Cascades" Canals were connected about this time by the construction of an additional lock, and became known as Cascades Canal.	DuVernet, Lt-Col., R.E.	Superintending Engineer.....	1819-24.
	Donatti, L., Depy. Asst. Com'ry-Genl.....	Superintendent.....	July, 1820.
	King, Capt. W., R.E....	Superintending Engineer.....	1826.
	DuVernet, Lt.Col., R.E.	Report on works..	1827-33.
	Baillairgé, Geo. F.....	Survey and plans of Ordnance Canals along the River St. Lawrence, with estimates of cost of utilizing water power at each.....	1857.

MURRAY CANAL (Lake Ontario).

(Between Head Waters, Bay of Quinte and Lake Ontario.)		(First official notice of this work occurs in a resolution adopted by the Lt-Gov. and Council, 1796.)	
Commenced, 1882.	Baird, N. H	Report on projected work.....	16 Nov., 1833
Contract signed, August, 1882.	Philpotts, Lt-Col., R.E.	do do	3 Aug., 1840.
J. D. Silcox & Co., contractors.	Keefer, Samuel	do do	1846.
Completed, 1889.	Page, John, sen.	Chief Engineer... ..	1853-90.
Length of canal and approaches, 9½ miles.	Rowan, James H	Survey, boring's, etc.	1870-71.
Length of cut across isthmus, 4½ miles.	Rubidge, Thos. S.....	Superintending Engineer	1881-86.
Breadth of canal, 80 feet.	Rosamond, Joseph A....	Resident Engineer.....	June, 1882-91
Depth of water, lowest level of lake, 11 feet.	Keeler, T. P.....	Superintendent.....	Augt. '89-91
Ordinary depth, 12 feet.			
It has no locks.			
Expenditure from 1st July, 1867, to 30th June, 1889, \$1,043,046.41.		NOTE.—For further particulars see Sessional Papers, No. 83, 6th March, 1883.	

OTTAWA AND LAKE HURON ROUTE.

ected.	Taylor, David	Survey of projected canal route, under instructions of Commissioners, appointed by Parliament of Upper Canada, 4th March, 1837.....	
aly's Survey.	Thompson, David.....		
ance, Montreal to Lake Huron via projected route, 430 miles.	Hawkins, Wm.....		
structed by rapids, for about 60 miles.	For Commissioners. See Capt. Baddeley, R.E., "Record of Engineers."	Reported thereon to Hon. John Macaulay, surveyor general of Upper Canada, J. Cartwright and Capt. Baddeley, Royal Engineers.....	
al rise Montreal to summit level 642 ft.	Page, John, sen.....	Chief Engineer, Public Works.....	1853-80.
al fall from summit level to Lake Huron 83 ft.	do	do Canals	1880-90.
the 60 miles obstructed	West, James.....	Proposed Georgian Bay, Lake Huron and Ottawa Canal.....	23rd Feb., 1856.
22 are already improved.			
Estimated cost, of Canals with locks 250 x 50 and 10 ft water on sills, by W. Shanly \$24,000,000.	Shanly, Walter.....	Proposed Ship Canal via River Ottawa, Montreal to Lake Huron.....	1857-58.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—*Continued.*

Works.	Engineers, etc.	Services.	Dates.
<i>Ottawa and Lake Huron Canal Route—Con.</i>			
Clarke's estimate for canals and dams with locks 250 x 45 and 12 ft water on sills \$12,000,000. See Public Works Report 1867-82.	Stewart, James	Survey, Ottawa and Lake Huron, proposed Ship Canal	1857-58.
	Shanly, Robert	do do	1857-58.
	Slater, James Dyson	do do	1857-58.
	Clarke, Thomas C.	Survey, and report on project	1859.

RAPIDE-PLAT CANAL (River St. Lawrence.)

Overcomes "Rapide-Plat Rapids" River St. Lawrence—one of the Williamsburgh Canals.	Clowes, Samuel	Report, estimate, and proposed line.	1826.
	Barrett, Alfred	Report, &c. do do	1830.
Commenced, 1844. Opened, Sept., 1847. Completed, 1848.	Mills, J. B.	{ Surveys, reports, &c. do	1833-43.
Length of canal, 4 miles.		Superintending Engineer	1843 to June, 1847.
Number of locks, 2.	Phillipotts, Lt.-Col., R.E.	Report to Imperial Government	1839-40.
Length of locks, 200 ft.	Keefer, Samuel	Chief Engineer	1841-52.
Breadth of locks, 45 ft.	Baillairgé, Geo. Fred.	Resident Superintending Engineer	1853-56.
Water on sills, 9 ft.	Page, John.	Chief Engineer	1853-90.
Rise or lockage, 11½ ft.	Macdonell, A. Greenfield	Superintendent, Williamsburgh Canals ..	26th April, 1875-89.
Enlargement commenced, 1883, in progress.		Died	27 Jan., '89.
Dimensions 270' x 45' x 14'.	Rubidge, Thomas S.	Superintending Engineer, enlargement ..	1880.
For cost of construction see Williamsburgh Canals.	Killaly, H. H., jun.	Resident Engineer, enlargement	Dec., 1884-88
	Rhéaume, L. N.	Engineering staff, enlargement	Dec., 1884.
	Reid, John	Superintendent	18th Oct., '89
		Died	13th May, '90
	Reid, John D.	Acting Superintendent	1st May, '90.

RIDEAU CANAL (Ottawa to Kingston.)

IMPERIAL GOVERNMENT WORK.

Connects River Ottawa at City of Ottawa, with Lake Ontario, at City of Kingston.	Jebb, Capt., R.E.	Proposed route, Ottawa to Kingston.	1815-17.
Commenced, 21st September, 1826.	Nichol, Col., R.E.	Ordered Capt. Jebb to survey Rideau Canal route	1815.
Finished for 45 miles on 12th September, 1831.	Clowes, Samuel	Proposed works, &c.	1823.
Originally opened 29th May, 1832.	Smyth, Major-Gen. Sir J. C., R.E.		
Locks opened, August, 1832	Hoate, Lt.-Col., Sir G. R. E.	Joint report and estimate	182
Len	Harris, Major, R. E.		
Brest			
Wre			

PUBLIC WORKS and their Engineers, &c. Canada—Canals, 1779–1891—Continued.

Works.	Engineers, etc.	Services.	Dates.
<i>Rideau Canal—Con.</i>			
Number of locks, 47.	Elliot, J. S.	Ordnance Commissioner, obtained lands from Mr. Sparks for Rideau Canal purposes prior to 1826.	
Ottawa to Kingston, 33 locks ascend, and 14 descend.	Finlay, John.	Dep. Asst. Commissary Gen., Supt. Div.	1827.
Lockage, 446½ ft.			1828.
Rise, 282½ ft.			
Fall, 164 ft.	By, Lt.-Col., R. E.	Superintending Engineer	Sept., 1826, to 1832.
Length of locks, 134 ft.	McTaggart, J.	Examination and Report for Imperial Government.	1827-28.
Breadth do 33 ft.			
Water on sills, 4½ to 5 ft.			
Expenditure prior to 1st July, 1867	Lewis, Col., R. E.	Commissioner, Rideau Canal const. Spring	1828.
Imp. Govt. \$3,911,791.47	Fanshaw, Col., R. E.	do do do	1828.
Prov. do 153,062.69			
Dom. Govt. up to 30th June, 1889. 121,097.76	Rudyerd, L.	Postmaster, Rideau Canal	1830.
	Hagerman, Joseph N.	Solicitor, Rideau Canal	1st Nov., 1831.
Total cost to 30th June, 1889. \$4,185,861.83	Baird, N. H.	Engineering staff	July, 1828-1832.
	Bolton, Major		1832-39-41
The "Pumper" was the name of the first craft that steamed up this canal.	Thompson, Lt.-Col.		1841.
Ordnance canals were maintained at the expense of the Provincial Government from 1st Oct., 1833. Their transfer from Imp. Govt. was accepted by Order in Council 25th Jan., 1834. Transferred by Prov. Act, 19th Vic. Cap. 45, 19th June, 1856.	Ford, Capt. Chas. E.	Royal Engineers, or Ordnance Officers, who controlled the Canal from 1832 to 1857, as nearly as can be ascertained.	1846.
	Chater, Lt.-Col.		1853.
	Harvey, Charles.		To 1857.
	Burrows, J.	Overseer of works	1832.
	Tughill, M.	Assistant Surgeons	1833.
	Kelly, W.		
	Frome, Lt.-Col., E. G., R. E.	Description of works	28th Feb., 1837.
The first stone of the Locks of this Canal, weighing above 1½ ton, was laid by Captain Franklin (afterwards Sir John), at 4 P.M. on the 16th of August 1827, after his return from the Mackenzie River and the Polar Sea.	Bolton, Major D., R. E.	Description Long Island dam, built 1836.	1839.
	Holloway, Col. William Cuthbert Elphinstone, C.B.	Testimony re Rideau Canal lands	15 Mar., '45.
	Thompson, Maj. Francis Renglet, R.E.	Testimony re Rideau Canal lands.	18 Mar., '45.
	Denison, Lieut. W., R.E.	Description of dams, locks, &c.	1830.
	Page, John, sen.	Chief Engineer.	1853-90.
	Coffin, Lt.-Col., W.	General Agent, Ordnance property	Sept., 1856, Jan. 1878.
	Killaly, J. S.	Superintending Engineer	Jan., 1857, to Apr., 1858.
	Slater, James Dyson	do do	10th June, 1858, to 1st Oct., 1872.
	Wise, Frederick, Ashworth, Millbank	do do	1st Oct., 1872-1891.
	Kingsford, William	Prepared Map of Canal showing area of water sheds, &c.	1872

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779–1891—*Continued.*

Works.	Engineers, etc.	Services.	Dates.
RIVIÈRE DU LIÈVRE LOCK AND DAM.			
This river falls into the Ottawa, 12 miles below Ottawa City. The lock, etc., is constructed to overcome "Little Rapids," 10 miles above Buckingham. Work in progress, 1890. Dimensions of Lock— Length, 162½ ft. Breadth, 32½ ft. Water on sill, 8 ft. Rise or lockage, 14 ft. Commenced in 1887— Expenditure to 1st July, 1890, \$182,186.72.	Perley, Henry F.	Chief Engineer, Public Works	1886-91.
	Hamel, Félix M.	Engineer in charge.	1887-91.
		Contract signed 29th December, 1886.	
		Messrs. Thompson & Poupore, contractors.	

SAUT-STE-MARIE CANAL (Between Lakes Huron and Superior.)

Through St. Mary's Island, to connect Lake Huron with Lake Superior, overcoming Saut-Sainte-Marie Rapids.	Brayères, Capt., R.E.	Report on claims, &c., in connection with a Canal constructed at Saut-Ste-Marie, on Canadian Territory before April 1892.	Prior to 23rd Dec., 1893.
Commenced by Govt. of Canada, 1887.	Mann, Col. Gother, R.E.	Correspondence, &c., re Canal.	18th April, 1893.
In progress 1890-91.		See "Record of Engineers"	1889.
Length of canal, $\frac{3}{4}$ of a mile.		Also Mr. Brynmor, Archivist's Report	1886.
Length of lock, 600 ft.	Almoy, J.	Report on Saut-Ste-Marie Canal to Legislature, State of Michigan, U.S.A., prior to	1847.
Breadth do 85 ft.			
Water on sills 18 ft.	Killaly, Hon. H. H.	Special Report.	30th Mar., 1847.
Lift, about 18 ft.			
To be completed, May, 1892.	Keefer, Samuel H.	Chief Engineer, Public Works, survey.	1852.
	Wise, Fred. A. M.	Engineering staff survey proposed canal.	1852.
Expenditure to 30th June, 1889, \$42,164.01.	Page, John, sen.	Chief Engineer.	1853-90.
	Crawford, Wm.	Chief Assistant Resident Engineer ...	1887-91.
	Curran, Veysie	Assistant Resident Engineer.	1st Mar., 1889-91.
	Thompson, W. G. Mc-Neil.	Resident Engineer in charge	Jan., 1889-91.

SHUBENACADIE CANAL (Halifax to Bay of Fundy.)

Commenced by Shubenacadie Canal Co. 25th July, 1826.	Hall, Francis Benjamin.	Reports, &c.	1825-26.
Capital of Co., £60,000, N. S. Currency.	Telford, Thomas	Founder of the Institution of Civil Engineers, Great Britain incorporated 3rd June, 1828. Stockholder, Shubenacadie Canal for £450. Report on plans, &c.	1825.
N. S. Govt. grant £15,000, and an annuity of £1,500, after 1829, for ten years.			

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—Continued.

Works.	Engineers, etc.	Services.	Dates.
<i>Shubenacadie Canal</i> —Continued.			
	Earl of Dalhousie.....		
<i>Original Design.</i>	Sir James Kempt.....		
Length of canal from Halifax Harbour to mouth of Shubenac- adie River, Basin of Minas, 53 miles, 10½ yards per Keating.	Sir Howard Douglas..... Rear Admiral Lake..... Maj.-Gen. Sir James Keane.....	Turned first sod.....	25th July, 1826.
No. of locks, 15.			
Length of locks, 87 ft.	Fairbanks, Charles Wm.	Engineer in charge.....	1847-58.
Breadth do 22½ ft.	Faulkner, Wm.....	Report to N. S. Govt.....	15th Dec., 1852.
Depth of water 8 ft.	Talcott, W. H.....	Report, plans, &c.....	1855-56.
Lockage, ascend'g, 95' 10" do descend'g, 95' 4"			
Total.....191 2'	Avery, James P.....	President.....	
See Stocklist, Journals— House Assembly, N.S., 1856.	Stairs, William.....	Directors... } Shubenacadie Canal Co., Gibson, John... } Gray, Samuel... } Secretary... }	1856.
NOTE.—The canal was purchased by the Halifax Land Improvement Co. in 1860. It was never completed according to the original design, al- though a small steamer passed through it from end to end.	Fairbanks, L. P.....	Superintendent and Proprietor.....	
	Keating, E. H.....	Paper on Shubenacadie Canal read before American Society Civil Engineers.....	
			21st Nov., 1883.

SPLIT ROCK (River St. Lawrence.)

One of the old canals on St. Lawrence replaced by the Beauharnois Canal.	Twiss, Capt., R.E.....	Designed by Governor Haldimand..... Superintending Engineer.....	1779-83.
Commenced and com- pleted between 1779 and 1783.	do.....	Report, to Imperial Government on Canals	1781.
Material, stone.	Mann, Col. Gotter, com- manding R.E.....	Report, to Imperial Government.....	24th Dec., 1800.
Length of canal, 200 ft.			
Breadth, 6 ft.	By, Lieut.-Col., R.E....	Report on works.....	24th April, 1805.
Water, about 2 ft.			
Lock rebuilt, 1804.	Clarke, Isaac Winslow, Dep. Com'ry-Genl....	Superintending Engineer.....	1800-22.
Length, 120 ft.			
Breadth, 9½ ft.			
Water, about 3 ft.			
Enlarged, 1817.	Long, Maj. Andrew, R.E.	Superintendent, enlargement and repairs.	1817.
Breadth, 12 ft.			
Water, 3½ ft.			
Portion of Lock still in existence, 1890.	Donatti, L., Dep. Asst. Com'ry-Genl.....	do.....	July, 1820.
	King, Capt. Wm., R.E..	Superintending Engineer.....	1826.
	Forbes, W. B., Dep. Com'ry-Genl.....	Superintendent, St. Lawrence Canals.....	1830.
This Lock was constructed by the Royal Staff Corps and was transferred by the Imperial to the Pro-	Yule, Capt. Patrick, R.E.	do construction and repairs, St. Lawrence Canals.....	1830-35.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—Continued.

Works.	Engineers, etc.	Services.	Dates.
<i>Split Rock</i> —Continued.			
vincial Governm't with other works. Transfer authorized by Canadian Parliament, 30th May, 1855, and accepted by O.C., 25th Jan., 1856.	Adams, John	Superintendent, Report on works	10th Sept., 1835.
	Coffin, Lieut.-Col. W....	General Agent, Ordnance property	Sept., 1856, to Jan. 78.
	Baillairgé, Geo. Fred....	Survey plans and report, Water Power..	1857.
STE-ANNE LOCK (Junction River St. Lawrence and Ottawa.)			
Overcomes Ste. Anne Rapid, on Ottawa River, between Lake "Two Mountains" and River St. Lawrence. Commenced 1816.	DuVernet, Lt.-Col., R.E.	Report and estimates of proposed canal and lock to replace wooden lock of 1816.	13th Dec., 1831.
Lock built of wood, in Vaudreuil channel, by St. Andrews' Steam Forwarding Co.; to pass steamers of 20 horse-power.	Hayne, Capt., R. S. Corps	Superintending construction Ottawa River Canals	1833-34.
Rebuilt, 1832-33, by Ottawa Forwarding Co. Material, wood. Size, same as Grenville Canal.	Yule, Capt. Patrick, R.E.	Plans canal and lock	1835.
Second enlargement commenced 18th May, 1840.	Barrett, John	Superintendent, St. Anne's Lock	April, 1849.
New stone lock, north side of river, 190 x 45 ft. 6 ft. water on sills at l.w.	Sippell, John G.	Superintending Engineer	1853-77.
Opened June 22, 1843.	do	Consulting Engineer	1877-1879.
Completed, Nov. 24, 1843.	Page, John, sen.	Chief Engineer	1853-90.
Third enlargement commenced in 1873.	Henshaw, Geo. H.	Resident Engineer	Oct., 1873-83.
Length of lock, 200 ft. Breadth do 45 ft. Water on sills, 9 ft.	Gerard, Arsène	Superintendent, St. Anne's Lock	1877 to Dec., 1878.
Completed towards 1883.	Baillairgé, G. F.	Superintending Engineer	22nd June, 1877-79.
Expenditure to 1st July, 1867, \$134,456.51.	Foreman, Thomas	Superintendent	1877.
Expenditure from 1st July, 1867, to 30th June, 1889, \$1,039,514.24.	Marceau, Ernest	Engineering staff, enlargement	Aug., 77-80.
Total expenditure to 30th June, 1889, \$1,173,970.75.	Daoust, Joseph Lunnina.	Superintendent	18th Dec., 1878-91.
	Stark, David	Superintending Engineer	1st May, 1880-90.
	Aylmer, J. A.	Engineering staff	1880-81.
	Sutcliffe, John	do	July, 1881-86.
	Marceau, Ernest	Assistant Engineer	Nov., 1880-90.
ST-OURS' CANAL, LOCK AND DAM (River Richelieu.)			
On Richelieu River. Raised the river from 4 to 7 ft., enabling vessels to enter Chambly Canal, 32 miles distant. Commenced, 1844.	Fleming, Peter	Report recommending dredging Richelieu River to avoid building lock and dam at St. Ours	1829.
Completed, 1st Sept., 1849.	Hopkins, W. R.	Proposed lock and dam at St. Ours	1835.
Length of canal, 1 mile. Number of locks, 1.	Barrett, Alfred	Report on project	1841.
Length of lock, 200 ft. Breadth of lock, 45 ft.	Walton, D. S.	Engineering staff, enlargement	1843-49.
	McDonald, J. F.	Superintending Engineer	1848-52.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—Continued.

Works.	Engineers, etc.	Services.	Dates.
<i>St. Ours' Canal, Lock and Dam—Continued.</i>			
Water on sills (lowest) 7 ft.	Harrison, Robert Newton	Superintendent, St. Ours Lock and Dam.	6th August, 1851.
Rise or lockage, 5 ft.	Sippell, John G.	Superintending Engineer.	July, 1853-77
Expenditure prior to 1st July, 1867, \$121,537.65 ; from 1st July, 1867, to 30th June, 1889, \$45,174.58 ; total expenditure to 30th June, 1889, \$166,712.23.	Hatt, Augustus	Superintendent, St. Ours Lock and Dam.	11th March, 1853-57.
	Page, John, sen.	Chief Engineer.	1853-90.
	Larue, Levis	Superintendent, St. Ours Lock and Dam.	Apr. 24, 1858-88.
	Baillairgé, G. F.	Superintending Engineer.	June 22, 77-79.
	Parent, E. H.	do	May 12, '80, 91.
	Codère, Alfred	Superintendent, appointed.	Sept. 1, '88.
	Papineau, L. G.	Resident Assistant Engineer.	1889-91.

ST. PETER'S CANAL, C.B., N.S. (Atlantic Ocean.)

This canal, on the Island of Cape Breton, connects the Atlantic Ocean, at St. Peter's Bay with the Bras-d'Or.

Dimensions proposed, 20 feet wide at bottom, and 12 feet water.—Estimated cost, £17,150 4s. 5d.	Hall, Francis Benjamin	Survey	1825.
	do	do	Report, &c., to Nova Scotia Government. 1826.
Estimate for canal 22 ft. wide at bottom and 13 ft. deep, £17,751 4s. 8d. Plans adopted.	Barry, P. J. S., R. E.	Report and estimates to Nova Scotia Government.	31 Aug., '53.
Dimensions proposed, width of canal at 10 ft. deep, 20 ft.; slopes, 1½ to 1; depth of water, 13 ft.; width at water line, 50 ft. Est. cost to complete, £34,000.	Laurie, James	Report and estimate.	16th July, '58
Estimated cost of completion if 22 ft. wide at the bottom, \$125,943.62; if 45 ft. wide at base, \$170,065.25.	Perley, Henry F	Report and Estimate cost of completion.	8th Feb., '65.
	do	Engineer in charge.	July, 1880-90
	Fairbanks, Charles W.	Report and estimates.	1850-52.
	Folsom, C. W.	Engineer in charge of construction	1854.
Commenced, 7th Sept., 1854, suspended, 1856, resumed, 1865.	Fuller, Thomas H.	Commissioners Report on progress of work	31st Dec., '56
Completed, 5th Aug., 1869.	Martell, Henry		
Length of canal, 2,400 ft.	Munro, Hugh		
No. of locks, 1.			
Length of lock, 122 ft.	Talcott, W. H.	Report, &c., on works.	1856.
Breadth do 26 ft.			
Water on sills, 13 ft.	McNab, Alex.	Engineer in charge.	July, 1865, to July, 1867
Enlarged, 1875-81.			
Length, 2,400 ft.	Dunlop, Mathew	Acting Superintendent.	1869, to June 1870.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—*Continued.*

Works.	Engineers, etc.	Services.	Dates.
<i>St. Peter's Canal, C.B., N.S.—Continued.</i>			
Length of lock, 200 ft.	Kavanagh, Wallace Morgan.	Superintendent.	June 3, 1870 to 1891.
Breadth of lock, 49½ ft.			
Water on sills, 18 ft. at l.w.	Page, John, sen.	Chief Engineer.	1867-90.
Rise of tide, 4 ft.			
Cost of construction to 30th June, 1867, \$156,523.32.	Barclay, E. J.	Engineering staff, enlargement	1875-81.
Completion and enlargement to 30th June, 1889, \$520,743.95.	Millidge, E. G.	Resident Engineer do	1875-81.
Total to 30th June, 1889, \$677,267.27.	Perley, H. F.	Superintending Engineer	May 1, 1872-90.
Contractors—			
John McLeod, 1855; work suspended, 7th Sept., 1856.			
Brooks, Foster & Co., contract dated 6th June, 1865.			
Patrick Purcell, 1867-69			
S. Parker Tuck, enlargement, 1875-77.			
Assignees of Tuck and Government, 1877-81.			

TAY CANAL (Branch of Rideau Canal.)

Connects the town of Perth with the Rideau Canal via River Tay. Constructed by Tay Navigation Co.		Commenced in 1831 by an incorporated company.	
Length of canal, 8½ miles.			
No. of locks, 5.			
Dimensions, 101' x 20' x 4'.			
Material, stone.			
Lift of locks, 28 ft.			
Commenced 1831.			
Opened 1834.	Page, John, sr.	Chief Engineer.	1853-90.
See General Report, Department Public Works, 1867.			
Enlargement and new works commenced 1883; completed 1889.	Wise, F. A. M.	Survey and Report.	
	do	Superintending Engineer, reconstruction.	1882-91.
W. Davis & Sons, contractors.	Taylor, Thomas Dixon.	Resident Engineer.	March, 82 to Jan. '89.
Length, 6 miles.			
No. of locks, 2.			
Length of locks, 134 ft.			
Breadth do 32 ft.			
Depth of water, 5½ ft.			
Lockage, 26 ft.			
Expenditure from 1st July, 1867, to 30th June, 1889, \$407,764.72.			

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779–1891—Continued.

Works.	Engineers, etc.	Services.	Dates.
TROU DU MOULIN (River St. Lawrence.)			
One of the old River St. Lawrence canals. Length, 200 ft. Water, 2 to 2½ ft. on sills. Commenced and completed between 1779 and 1783.	Transferred by Imp. Govt. to Prov. Govt. with the other ordnance canals— accep. by O.C. 25 Jan. '76 Twiss, Capt., R.E. do Mann, Col. Gother, R.E.	This work was designed by Governor Haldimand; was re-placed by another canal at the foot of the Cascades Rapids in 1804. Superintending Engineer..... Report on canals to Imperial Government. 1781. do do ..	1779-1783. 24th December, 1800.

WELLAND CANAL (Between Lakes Ontario and Erie.)

Connects Lakes Ontario and Erie, carrying navigation around the Falls of Niagara.	Gourelay, Robert	Views respecting projected canal.....	1819.
Commenced 30th Nov., 1824.	do	"Statistical account of Canada," with map of district, and necessity for the canal, published in London.....	1822.
Completed, 30th Nov., '29.	Tibbet, Hiram.....	Description of a projected canal.....	1823.
Constructed by a company with Imperial and Provincial aid.	Clowes, Samuel.....	Proposed works	1824.
No. of locks, 40. (Wooden).	Clowes, James.....	Survey and report.....	10th August, 1824.
Dimensions, 100'x22'x7½'.	Cusack, Rheddy.....	Reports on levels, surveys, etc.....	10th and 24th May, 1824.
Length of canal, 28 miles.	Roberts, Nathan S. (Eng.)	Examined route with Clowes and Hall. Report.....	Aug. 28, '24.
Rise or lockage, 330 ft.	do	Engineering Staff construction, appointed	1st April, '25.
Depth of water prop. 8 ft.	Hall, Francis Benjamin..	Examined projected canal route with Messrs. Clowes and Roberts.....	1824.
Resolution to purchase stock of company passed Assembly, April, 1839.	Smyth, Major Gen. Sir Jas. Carmichael	Examined works, reported favorably.....	Prior to 1826.
Canal became public property 5th July, 1841.	Barrett, Alfred	Resident Superintending Engineer, appointed	10th May, 1826.
<i>First Enlargement.</i>	Lapham, Mr.....	Asst. Engineer Welland Canal Co.....	Augt. 1827.
Completed 1845 to Port Matland and in 1850, to Port Colborne.	Thompson, David.....	Principal Consulting Engineer	1824-28.
Length of canal, 27½ miles.	Rendall, James M.	Report on progress.....	31st May, '30.
No. of locks, 27.	Keefer, Geo., jr.....	Superintending Engineer.....	1833.
Material, stone.	Donaldson, John.....	Superintendent of works.....	23rd Feb., 1833.
Dimensions, 150 x 26½ x 8½, except guard lock, Port Colborne, 220 x 45, and 2 locks between Lake Ontario and St. Catharines, 200 x 45 feet.	Farnsworth, S. H.....	Assistant Superintendent of works.....	March, 1833.
Water on sills 9 feet.	Wright, Benjamin	Projected enlargement	1833
In 1853-54 the depth of water was increased to 10½ feet by raising banks and dredging.	Callahan, —.....	Superintendent. Division of Canal	1836.
<i>Second Enlargement.</i>	Baird, N. H.....	Report on projected enlargement	1837.
Commenced 1873.	Robinson, William B....	Superintendent	1st Oct., '37.
Completed 1883 to 12 ft.	Killaly, Hamilton H....	Survey with N. H. Baird for enlargement	1837.
Completed 1887 to 14 ft.	Woodruff, Samuel D....	Superintendent	1839-71.
	Phillipotts, Lt.-Col., R.E.	Report on proposed enlargement	1841.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—*Continued.*

Works.	Engineers, etc.	Services.	Dates.
<i>Welland Canal—Con.</i>			
Length of canal, 26 $\frac{3}{4}$ miles.	Keefer, Samuel	Chief Engineer, Public Works	1841-52.
No. of locks, 27.		Report on proposed enlargement	14th Feb., 1873.
Length of locks, 270 ft.	do	Assistant Engineer	1842-45.
Breadth do 45 ft.	Keefer, Thos. C.		
Water on sills, 14 ft.			
Rise or lockage, 326 $\frac{3}{4}$ ft.			
<i>Branches Welland Canal.</i>			
	Page, John, sr.	Asstt. Engineer and Draughtsman	1842.
River Branches—Length $\frac{3}{4}$ mile; two locks 150 x 26 x 9 $\frac{1}{2}$ feet.	do	Consulting Engineer	1846.
Grand River Feeder—Length 21 miles, two locks, one 200 x 45 x 9 and the other 150 x 26 $\frac{3}{4}$ x 9 feet.	do	Chief Engineer	1854-90.
Port Maitland Branch—Length 1 $\frac{1}{4}$ miles, one lock 185 x 45 x 11 feet.	do	Survey proposed enlargement begun	1870.
	do	Reports on enlargement of Canals, Lake Erie to Montreal	1872-77.
	Buchanan, W. O.	Assistant Engineer	1843.
	Slater, J. D.	Engineering Staff	1842-46.
Expenditure by Imperial Government, \$222,220.00; expenditure by Provincial Government prior to 1st July, 1867, \$7,416,019.83; expenditure from 1st July, 1867, to 30th June, 1889, \$16,149,710.47. Total expenditure to 30th June, 1889, \$23,787,950.80.	Barrett, Alfred	Asst. Chief Engineer, locating works	1826, 42-43.
	Power, Samuel	Principal Engineer	1842-45.
	do	Specifications for construction of locks	Oct., 1843.
	Pritchard, M. B.	Assistant Engineer, Welland Canal	1843-44.
	Keefer, Samuel H.	Superintending Engineer construction	24th June, 1846.
	Shanly, Walter	Consulting Engineer	1846.
	Stoker, Geo.	Report plan and estimate	Oct., 1854.
	do	Assistant Engineer	1864.
	Monro, Thomas	Survey and locating enlargement	1870-71.
Directors Welland Canal Company, appointed 15th May, 1824:—	Fellowes, Chas. L.	Engineering staff, enlargement	1870-76.
Hon. Sir John Henry Dunn,	Brunel, A.	Superintendent	1871 to 1874
Wm. H. Merritt,	Thompson, Wm. G. McN.	Resident Engineer, South Division, enlargement	1872-88.
Geo. Keefer,	Secord, Wm. F.	Engineering staff, South Division, enlargement	Oct., 1872.
John Decou,			
Samuel Clowes.			
Commissioners to superintend expenditure of money, Welland Canal, appointed 13th February, 1833:—	Leslie, William Lewis ..	do do	Oct., 1872.
Wm. B. Robinson,	Odium, John Ed.	Asst. Engineer, South Division, enlargement	1872-1888.
Abraham Shade,	Monro, Thomas	Engineer in charge of works	July, 1872 to 31st Jan'y, 1873.
John McAnlay.			
The first vessels that passed through the Welland Canal, from Lake Ontario to the Welland River, were the "Annie and Jane" and "R. H. Boughton," 30th November, 1829.	Gzowski, Col. C. S.	Report on proposed enlargement	14th Feb., '73
	McAlpine, Hon. W. T., of U. S. A.	do do	14th Feb., '73
	Monro, Thomas	Resident Engineer, North Division, enlargement	1873-1888.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—*Continued.*

Works.	Engineers, etc.	Services.	Dates.
<i>Welland Canal—Con.</i>			
Note.—Oliver Phelps was contractor for the works on the 4th of August, 1827.	Curran, Veysie.	Asst. Engineer, South Division, enlargement	Nov., 1873 to 1st Jan., '89
	Dickinson, Jos. E.	Asst. Engineer, North Division, enlargement	15th July, 74 to 30th Dec., 1879.
	Bodwell, E. V.	Superintendent.	1874 to 1st Jan., 1880.
	James, C.	Engineer, South Division, enlargement..	1875.
	Kelly, Athol D.	Engineering staff, North Division, enlargement.	1875.
	McNaughton, Chas E.	do do	1875.
	Merritt, Thomas	do do	1875.
	Simpson, Frank.	do do	1876.
	King, Chetwood Henry Waters.	Engineering staff, South Division, enlargement	Feb., 1883, to Nov., 1888.
	French, Barnard J.	Engineering staff, North Division, enlargement	1876.
	Fellowes, Chas. L.	Engineering Staff, Surveys	1870-76.
		Asst. Engineer, North Division, enlargement	1st July, 76-1882.
	Townsend, T. B.	Contractor, lock gates.	1880.
	Ellis, William	Superintendent, appointed.	1st Jan., '80.
	Willet, Herbert Alfred.	Engineering Staff, South Division, enlargement	Aug., 1881-88
	Crawford, William.	Asst. Engineer, deepening to 14 feet.	1st June, '86 to 1st Aug., 1887.

WHITLAS' RAPIDS, LOCK, &c. (River Trent.)

Part of Trent River navigation, to connect Bay of Quinte, Lake Ontario, with Lake Huron, distance direct, 112 miles; proposed river route, 235 miles; lockage rise, 589½ feet; fall, 243½ feet; total, 832½ feet. Commenced, 1837. Completed, 1843. Dimensions of lock, 133½ x 33 x 5 ft.	Bethune, J. G.	Commissioners, superintending Newcastle District Works.	1833.
	Brown, Robert.		
	Hall, John.		
	Reed, Thomas		
	McDonell, A.		
	Baird, N. H.	Reports, &c.	1833-43.
	Rubidge, F. P.	Compiled map Trent River.	1836.
	Baird, N. H.	Superintending Engineer.	1837.
	Killaly, Hamilton H.	Report, prior to	1843.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—*Continued.*

Works.	Engineers, etc.	Services.	Dates.
<i>Whitlas Rapids, Lock, &c.</i> —Continued.			
For cost Trent River Navigation, See "Bob- caygeon Canal."	Keefer, Samuel.....	Chief Engineer.....	1841-52.
	do	Special report.....	1846.
	Rigney, James.....	Asst. Engineer.....	1843-49.
	Lyons, James.....	do	1843-49.
	Page, John, sen.....	Chief Engineer.....	1853-90.
	Ranney, G. W.....	Superintending Engineer.....	1855-73.
	Baillairgé, G. F.....	Assistant Chief Engineer.....	1871-79.
		Reports and Estimates, Trent R. Works.	1863-74.
	Belcher, Thomas D.....	Superintending Engineer.....	1873-84.
	Rogers, R. B.	Asst. Engineer.....	1878-81.
	do	Survey Trent Valley District	1882-83.
	do	Superintending Engineer.....	1st July, '84- 1891.
	Perley, H. F.....	Chief Engineer.....	1880-91.

WIDOW HARRIS OR NINE-MILE RAPIDS (River Trent).

Part of projected Trent River navigation, Bay of Quinté, Lake Onta- rio, to Lake Huron—	Bethune, J. G.....	Commissioners superintending Newcastle District works.....	1833.
	Brown, Robert.....		
	Hall, John.....		
	Reed, Thomas.....		
	McDonell, A.....		
From Trenton, up to this locality, the Trent is a continuous rapid for 9 miles; thence to Chis- holm's Lock, navigation commences.	Baird, N. H.....	Report on project	1833-36.
	do	Superintending Engineer.....	1837-41.
	Rubidge, F. P.....	Compiled map Trent River.....	1836.
	Keefer, Samuel.....	Chief Engineer.....	1841-52.
For cost of Trent River Navigation, See "Bob- caygeon Canal."	Killaly, H. H., sen.....	Report prior to	1843.
	Rigney, James.....	Assistant Engineer	1843-49.
	Lyons, James	Superintending Engineer	1843-55.
	Page, John, sen.....	Chief do	1854-80.
	Ranney, G. W.....	Superintending do	1855-73.
	Baillairgé, Geo. Fred....	Assistant Chief Engineer.....	1871-79.
		Reports and Estimates, Trent R. Works.	1863-74.
	Rogers, R. B.....	Asst. Superintendent	1878-81.
	do	Survey Trent Valley Canal	1882-83.
	do	Superintending Engineer.....	1884-88.
	Perley, Henry F.....	Chief Engineer.....	1880-91.

PUBLIC WORKS and their Engineers, &c., Canada—Canals, 1779-1891—*Continued.*

Works.	Engineers, etc.	Service.	Dates.
WILLIAMSBURGH CANALS (River St. Lawrence.)			
See Farran Point, Rapide Plat, Point Iroquois, Galops and Junction Canals.	Mills, J. B.	Reports and surveys, projected works . . .	1833-43.
	do	Superintending Engineer	1843 to June, 1847.
Commenced, 1844. Completed, 1847.	Wright, Benjamin	Projected canals	1833.
	Geddes, —	Consulting Engineer	1834.
Expenditure by Provincial Government prior to 1st July, 1867, \$1,320,655.54.	Fleming, Peter	Superintending and Consulting Engineer . . .	1834.
Expenditure from 1st July, 1867, to 30th June, 1889, \$504,098.68.	Killaly, H. H., sen.	Chairman Board of Works	1841-46.
Total expenditure to 30th June, 1889, \$1,824,754.22.	Keefer, Samuel	Chief Engineer Public Works	1841-52.
	Phillipotts, Col. R. E.	Report, &c.	1843.
	Rubidge, Thos. S.	Engineering staff	1844-48.
	Page, John, sen.	Resident Superintending Engineer	1850-53.
	do	Chief Engineer	1853-90.
	Baillairgé, G. F.	Resident Superintending Engineer	1853-56.
		Assistant Chief Engineer	1871-79.
	Macdonell, Alex. G.	Superintendent	26th April, 1875-1889.
		Died	27th Jan., '89.
	Rubidge, Thomas S.	Superintending Engineer, enlargement . . .	1880.
	Reid, John	Superintendent, appointed	18th Oct., '89.
		Died	13th May, '90.
	Reid, John D.	Acting Superintendent	1st May, '90.

YAMASKA RIVER (South side of River St. Lawrence.)

Lock and dam at Ile à Perley, enables vessels to ascend Yamaska River 20 miles to 'Rapide de la Grosse Roche'. Commenced, Aug., 1881. Opened, 2nd Sept., 1885.	Cardin, Henry F.	Chief Engineer	1880-91.
	Michaud, C. E.	Resident Engineer	1880-88.
	Mooney, Wm.	Assistant do (Died 2nd January, 1885).	1880-84.
Length of lock, 162½ ft. Breadth do 31 ft.	Berlinguet, Thos	Engineer in charge	1888-91.
Depth of water— Lowest, 5½ ft. Highest, 10½ ft.		The first contract for this work was signed Aug., 1881, Messrs. Goherty, Brecken and Davis, contractors. They abandoned the work, and a contract was entered into with Messrs. McCannon & Cameron on the	3th July, '84.
Expenditure to 1st July, 1890, \$124,792.39.		Lock completed and in working order . . .	2th Sep., '85.

PUBLIC WORKS and their Engineers, &c., Canada—Graving or Dry Docks.

Works.	Dimensions and Expenditure.	Engineers, Contractors, &c.	Dates.
<i>Esquimaux Graving Dock.</i>			
Work authorized by Act of Provincial Government. As completed up to 1890— of British Columbia, 43 Vic., cap. 8. Situate on Vancouver Island, about three miles below Victoria. Plans of dock and caisson prepared and furnished by Government of British Col- umbia—and exhibited, former, 18th Nov., 1879; latter, 1st Dec., 1882. Completion by Dom- inion Government, authorized by Act 47 Vic., cap. 6. Agreement between Dominion Gov- ernment and Government of British Columbia under sanction of Imperial Government, respec- tively, 1880. Graving dock and ground trans- ferred to Dominion Government, and work commenced, under authority of Act 47 Vic., cap. 6. Dock completed and opened to H. M. S. "Corno- rant," in July, 1887.	Length at centre, 430 feet. Width at bottom, 41 do on floor. do coping level, 90 feet. do entrance, 65 do Depth of water on sills, 26½ feet at H. W. Springs. Spring tides, rise, 7 to 10 feet. Neap tides rise, 5 to 8 feet. Expenditure— Pro. Govt., B. Columbia... \$384,512 66; Imperial Government..... 243,333 33; Dominion Government 529,214 42 Total to 17th Dec., 1889, \$1,157,060 41	Trutch, Hon. J. W., Engineer in charge Bennett, W., Resident Engineer Perley, Henry F., Chief Engineer Public Works, <i>Contractors.</i> McNamee & Nish, under British Columbia Government Their contract cancelled by Government of British Columbia and work carried on by day's labour... Larkin, Murphy & Connolly, for completion of work under the Dominion Government; contract signed, 8th Nov., 1884. Dominion Bridge Co., Montreal, for caisson Watt, James, & Co., London, Great Britain, pumping machinery. Devereux, John, Dockmaster Muir, A., C. Engineer Grieve, A. D., Carpenter	24th Nov., 1883. do 1884-91. 1880. 1882-83. 8th Nov., 1884. 10th July, 1885. 17th Sept., 1887. 1st April, 1887. 1st Dec., 1887.

Works.	Dimensions and Expenditure.	Engineers, Contractors, &c.	Dates.
<i>Halifax Graving Dock.</i>			
Situate at Halifax, N. S. Constructed by Halifax Dry Dock Company, incorporated in Great Britain. Agreement with Public Works Department, Canada, signed 13th February, 1886. Work commenced 1st May, 1886. Ordered by Admiral Watson, Commander-in-Chief N. A. and W. I. Station. H. M. S. "Canada" docked 20th September, 1889. Approved by Henry F. Perley, Chief Engineer, Public Works Department, 21st September, 1889.	Length, 585 feet. Width at coping level, 102 feet. do entrance 89½ do do bottom 72 do Water on sills— Ordinary spring tides, 30 feet. Spring tides rise 6 do Neap do 3 do Subsidies— Imperial Government, per annum for 20 years, \$10,000. Dominion Government, per annum for 20 years, \$10,000. City of Halifax, per annum for 20 years, \$10,000. Total cost, about \$1,000,000.	Keating, E. H., Superintending Engineer construction 1886-89. do Resident Chief Engineer. 1889-91. Perley, Henry F., Chief Engineer, Public Works Department. 1889-90. Pearson & Son and Brookfield, Messrs., contractors. 1886. Brookfield, Samuel M., local contractor. 1886-89. McPherson, David, Dockmaster. 1889-91.	1886-89. 1889-91. 1889-90. 1886. 1886-89. 1889-91.
<i>Kingston Graving Dock.</i>			
Situate at the City of Kingston, north side Lake Ontario. Commenced 23rd April, 1889. Estimated date of completion, 23rd April, 1891. Estimated cost, \$250,000.75.	Length on floor, 280 feet. Width at coping level, 79 feet. do entrance 55 do Width on floor, 47 feet. Depth from coping to floor, 26 feet. do of water on sills at low water, 15½ ft. Height of water varies 3½ feet.	Strong, W. O., Engineer in charge. Perley, George E., Assistant Engineer. Perley, H. F., Chief Engineer Public Works Contractors. Connolly, N. K.) Connolly, M.)	1st Dec., 1888-91. June, 1888-91. 1889-91. 23rd April, 1889.

Public Works and their Engineers, &c., Canada—Graving or Dry Docks—Continued.

Works.	Dimensions.	Feet.	Harbour Commissioners, Quebec.	Appointed.	Engineers, Contractors, &c.	Dates.
<i>Levis Graving Dock.</i>	Length:—	495	<i>Under Act, 36 Vic., cap. 62.</i>			
Work authorized by Act 38 Vic., chap. 56, 1875.	With a circular head. Radius	31	Grant, Thos. H.	a Oct.	2, 1873 Kinipple & Morris, Superin-	1875-1882.
Situated at Point Levis, on the St. Lawrence, opposite the City of Quebec.	And a square off-set each side.	19	Chabot, Julien.	a do	2, 1873 tending Engineers.	1875-82.
	Breadth at entrance.	62	Giblin, John.	a do	6, 1873 Fraser, Cecil, Asst. Engineer.	1876-1889.
	do bottom.	73	Ross, James G.	a Aug.	28, 1875 Boswell, St. George, Engineer.	1876-1883.
	do coping level.	100	do Retired by lot.	a July	6, 1875 Pilkington Staff.	1883-1887.
Work commenced, under Harbour Commissioners of Quebec, 1878.	Depth of water on sill at H. W. ordinary spring tides.	25½	Gilmour, John	a Aug.	6, 1873 Pilkington, Woodford, Resident Engineer.	Sept. 1883-90.
Completed, under Department of Public Works, Sept., 1883-89.	Depth of water on sill at H. W. ordinary neap tides.	23	Sharples, John	a do	6, 1873 Boyd, John Edward, Resident Engineer.	April 1, 87-90.
	Depth of water on sill, at L. W. ordinary spring tides.	7½	Dobell, R. R.	a do	4, 1873 Engineer.	1889-90.
Expenditure on construction to the 30th June, 1890, \$942,194.90.	Depth of water on sill, at L. W. ordinary neap tides.	10	LeDroit, T.	a June	6, 1874 Perley, H. F., Chief Engineer.	13th Oct., 1890.
			Simmons, J. H.	a Aug.	4, 1873 Public Works.	
			do Retired by lot.	a July	21, 1874 Bernier, J. E., Superintendent.	
			do Re-elected.	a Aug.	3, 1874 Langevin, H. LaForce, Asst. Engineer.	
			Fraser Alex.	a June	6, 1874 Valiquet, Ulric, Engineer in charge.	
			<i>Under Act 38 Vic., cap. 55.</i>			
			Thibault, Hon. Isidore.	a Mar.	15, 1876 Contractors.	
			7½ Chauveau, Hon. S. I. O.	a do	15, 1876 Larkin, Connolly & Co., masonry, &c.	17th Aug., 78-83
			Woods, Alex.	a do	5, 1878 do dredging.	1882.
			Sheehy, Joseph.	a do	15, 1876 do masonry.	Sept., 1883-88.
			Sewell, Edm. W.	a do	15, 1876 Carrier, Laine & Co., pump-	30th Mar., 1890.
			Fry, Henry.	a do	1, 1877 ing machinery.	7th Jan., 1890.
			do Re-elected.	a do	9, 1879 Wigham, Richardson & Co., contractors for caisson, &c.	
			Burstell, John.	a do	20, 1876 Engineers.	
			do Re-elected.	a do	20, 1876 Plunkett, E. W., estimators, plan, &c., to Harbour Com-	15th Dec., 1874
			+Dobell, R. R.	a Nov. 22	5, 1876 masons.	1874-76.
			do Re-elected.	a Aug.	6, 1877 1889 Ballaigue, Charles, plans, &c.	1875.
			do do	a do	2, 1883 1876 Berlinguet, F. X., plans, &c.	6th April, 1875.
			do do	a do	2, 1886 1877 Sewell, Alex., plans, &c.	1875-1882.
			do do	a do	2, 1889 1880 Kinipple & Morris, M. I. C. E., Superintending Engineers.	1875.
			Simmons, Jos. H.	a Jan.	6, 1877 1876 contractors for caisson, &c.	
			do Re-elected.	a Aug.	2, 1880 1877 Plunkett, E. W., estimators, plan, &c., to Harbour Com-	
			do Retired.	a Jan.	2, 1886 1889 Ballaigue, Charles, plans, &c.	
			+Rae, William.	a Nov.	2, 1889 1880 Kinipple & Morris, M. I. C. E., Superintending Engineers.	
			do Re-elected.	a Aug.	1, 1877 Fraser, Cecil, Asst. Engineer.	

[illegible][illegible]

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Section 10 of the Trade Union Act, 1902, the Government made the appointments as per Act.

APPENDICES.

PART IV.

APPENDIX No. 22.

MEMORANDA.

ATLANTIC TO THE PACIFIC AND ARCTIC OCEANS,
ARCTIC VOYAGES
VOYAGES OF DISCOVERY IN THE NORTH,
AND
PUBLIC WORKS,
ETC., ETC.
BY
G. F. BAILLAIRGÉ,
DEPUTY MINISTER OF PUBLIC WORKS.

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LETTER

OF

His Honour John Schultz, Lieutenant-Governor of Manitoba,

RESPECTING

HISTORICAL MAP OF CANADA.

(TO BE PUBLISHED.)

GOVERNMENT HOUSE, 12th July, 1889.

DEAR MR. BAILLAIRGÉ,—The only apology I can offer you for the long delay in answering your letter of the 15th May is, that I found it very difficult, after an absence of a month in British Columbia, to overtake even State correspondence, and later I found that I had mislaid your very kind letter.

Allow me to thank you, thus late, for the map you sent, which displayed on itself, not only very great photographic care, but in the additions made by hand, a more intimate knowledge of the more northern portion of our great North-West than I had supposed possible for one who had not travelled through it. To my mind you have collected, collated and recorded, information of the greatest possible future use for Canada, and I feel that the Government could not possibly spend the public money on an object more likely to be of national use, and I hope to see, before long, your map in the hands of all the members of our Legislature, and in every school in the country. Nothing, in my opinion, would do more to convey to Canadians an idea of the vastness and richness of their great heritage than the wide distribution of your map. You ask me to point out any omissions in the copy which I have received, but I can scarcely do so here, as none of the public or parliamentary libraries contain the authorities which I would have to consult; but, in the event of your map being published, I would go to Ottawa and aid you in any possible manner. I may mention incidentally however, now, that you have, I think, the eastern boundary of the district of Keewatin too far west. However, I have no doubt, that before publication, you will have this defined from an authoritative source. Recent decisions conflict as you are aware, with the former boundaries, and an Act of the Dominion Parliament will have to settle it. Still I have no doubt but that the Surveyor-General, or the Department of Justice, or both, will be able to give you a hint.

Again thanking you, dear Mr. Baillairgé, for your very valuable map which now hangs in my library.

Believe me with best wishes,

Very faithfully yours,

[Signed] JOHN SCHULTZ.

G. F. BAILLAIRGÉ, Esq.,

Deputy Minister of Public Works, Ottawa.

The map has since been submitted to the Surveyor-General and corrected according to the most recent data, with which he was kind enough to furnish me.

G. F. BAILLAIRGÉ.

PART I.

DOMINION OF CANADA, ETC.

AREA AND POPULATION,

1605 to 1890.

AREA AND POPULATION.

Dominion of Canada and Newfoundland, &c., 1890.

PROVINCES, DISTRICTS, TERRITORIES.	Entered Confederation or Organized.	SQUARE MILES.			Popula- tion, Census 1881.	Persons to the Square Mile.
		Land.	Water.	Total.		
Manitoba, Province.....	Entered Confedera- tion 15th July, 1870	65,000	9,000	74,000	65,954	1·00
Saskatchewan, District.....	Organized 8th May, 1882.....	101,400	7,000	108,400	56,446	0·04
Assiniboia do	do	89,650	550	90,200		
North-West Territories.....	.....	859,600	46,400	906,000		
Athabasca, District.....	Organized 8th May, 1882.....	103,300	1,200	104,500		
Alberta do	do	105,850	250	106,100	49,459	0·13
British Columbia, Province....	Entered Confedera- tion 20th July, 1871	382,300	1,000	383,300		
Ontario do	Entered Confedera- tion 1st July, 1867	219,650	2,350	222,000	1,923,228	9·00
New Brunswick do	do	28,100	100	28,200	321,233	11·43
Nova Scotia do	do	20,550	50	20,600	440,572	21·44
Prince Edward Island do	Entered Confedera- tion 1st July, 1873	2,000	.....	2,000	108,891	54·44
Quebec do	Entered Confedera- tion 1st July, 1867	227,500	1,400	228,900	1,359,027	6·00
Territory east of Hudson's Bay	.....	352,300	5,700	358,000	Unknown.	.....
Islands in Arctic Ocean and Hudson's Bay.....	.....	300,000	.....	300,000	do	.....
Keewatin, District.....	Organized 1876.....	267,000	15,000	282,000	do	.....
Territory east of Keewatin and south of Hudson's Bay.....	.....	194,300	2,500	196,800	do	.....
Great Lakes and River St. Law- rence east to Long. 66°, and portions within United States, not included in above areas..	.....	.....	47,400	47,400	.....	.....
Totals.....	.....	3,318,500	139,900	3,458,400	4,324,810	1·33
Labrador—East Coast on the Atlantic from Blanc Sablon to Cape Chud- leigh, under Government of Newfoundland, say.....	.....	.....	.....	40,000	4,000	.....
Newfoundland .....	.....	.....	.....	42,734	187,411	.....
do French Shore, from Cape Ray to Cape St. John, say.....	.....	.....	.....	.....	10,000	.....
Increase since Census 1881—Estimated at 1·5 per 100.....	.....	.....	.....	.....	4,526,221 678,933	.....
Total, 1890—Estimated.....	.....	.....	.....	3,541,134	5,205,154	.....

NOTE.—Capt. E. Deville states that the area of the Province of Quebec in the foregoing table of areas furnished by him, does not extend beyond the height of land; and also that the areas of the great lakes Ontario, Erie, Huron and Superior, do not comprise the portion within the United States boundary.

For further details respecting lakes and rivers, see pages 26 to 32.

G. F. B.

OTTAWA, 13th June, 1890.

AREA and Population of the United Kingdom and United States of America.

Countries.	Area in Square Miles.	Population, Census of 1881.	Persons to the Square Mile.
Great Britain and Ireland, comprised below in Europe. . .	121,115	36,100,000	298
United States of North America.....	3,603,884	50,445,336	14

AREA and Population of British Possessions in the World in 1881.

British Possessions in Europe.....	121,235	36,275,774	300·00
do Africa.....	352,025	2,570,535	7·00
do Asia.....	1,584,525	257,309,731	1·62
do America.....	3,620,210	6,395,198	1·77
do Australasia.....	3,079,034	2,741,634	0·89
Total British Possessions.....	8,757,029	305,292,872	35·00

AREA and Population of the World in 1890.

Continent of Europe.....	3,800,000	347,000,000	91
do Africa.....	11,800,000	197,000,000	17
do Asia.....	17,600,000	789,000,000	45
do America.....	16,500,000	112,000,000	7
do Oceanica.....	3,900,000	38,000,000	10
Area of the Earth about.	53,600,000	1,483,000,000	28

NOTE.—The population of Great Britain and Ireland is now estimated at more than 38,000,000 and that of the United States at more than 60,000,000.

PROGRESSIVE POPULATION.

ACADIAN POPULATION.

ABORIGINAL POPULATION.

1605 to 1890.

CHRONOLOGICAL Record of the Population of New France, Acadia, etc. (now the Dominion of Canada) progressively, from 1605 to 1881.

Date.	Localities.	Popula- tion.	Date.	Localities.	Popula- tion.
1605	Port Royal.....	44	1749	Acadia, N.B., French pop. of.....	1,000
1608	Quebec.....	28	1749	St. John Island, P.E.I., French pop. of.....	1,000
1620	do.....	60	1752	Acadia, N.S., English and German. Acadia Peninsula, French.....	4,203
1628	New France.....	76	..... Ile-Royale, French.....	4,325	
1629	Quebec (90 English).....	117	..... Acadia, N.B.....	1,530	
1641	New France.....	240	..... St. John Island, P.E.I.....	2,090	
1653	do.....	2,000	1754	New France.....	55,009
1663	do.....	2,500	1754	Nova Scotia, Br. pop.....	5,000
1665	do (de Jure).....	3,215	1760	New France.....	70,000
1667	do.....	3,918	1762	Nova Scotia, Br. pop.....	8,104
1668	do.....	6,282	1763	do do.....	9,000
1671	Acadia.....	441	1764	do do (including por- tion of the Acadians).....	12,988
1673	New France.....	6,705	1765	New France.....	69,810
1675	do.....	7,832	1767	Nova Scotia (a few Acadians in- cluded).....	11,779
1676	do.....	8,415	1772	Nova Scotia, Br. pop.....	17,000
1679	do.....	9,400	1775	Canada (all).....	90,000
1679	Acadia.....	515	1781	Nova Scotia, Br. pop.....	12,000
1680	New France.....	9,719	1784	Canada (whole of).....	113,012
1681	do.....	9,677	..... Loyalists not included.....	10,000	
1683	do.....	10,251	1784	Nova Scotia, Br. pop.....	32,000
1685	do (1,538 Indians included).....	12,263	..... Loyalists included.....	20,000	
1686	Acadia.....	885	1790	Canada, whole of, Quebec, Three Rivers and Montreal Districts.....	161,311
1688	New France.....	11,562	1790	Nova Scotia, Peninsula only.....	30,000
1692	do.....	12,431	1793	Cape Breton (separated from N. S., 1784).....	2,000
1693	Acadia.....	1,009	1797	St. John Island, P.E.I. (separated from N.S., 1770).....	4,500
1695	New France.....	13,639	1806	New Brunswick (separated from N. S., 1784).....	35,000
1695	St. John River, N.B.....	49	1806	Prince Edward Island (so-called in 1798-1800).....	9,676
1698	New France.....	15,355	1806	Canada, Upper (estimated).....	70,718
1698	Acadia, portion of.....	789	1806	do Lower ".....	250,000
1701	Acadia, North of Peninsula of.....	1,134	1807	Nova Scotia ".....	65,000
1703	do do.....	1,244	1811	Canada, Upper ".....	77,000
1706	New France.....	16,417	1814	do Lower ".....	335,000
1707	do.....	17,204	1814	do Upper ".....	95,000
1707	North Peninsula of Acadia.....	1,484	1817	Nova Scotia ".....	81,351
1712	New France.....	18,440	1822	Canada, Lower.....	427,465
1713	do.....	18,119	1822	Prince Edward Island (estimated).....	24,600
1714	do.....	18,964	1824	Canada, Upper.....	150,066
1714	North Peninsula of Acadia.....	1,773	1824	New Brunswick.....	74,176
1716	New France.....	20,531	1825	Canada, Upper.....	157,923
1718	do.....	22,583	1825	do Lower.....	479,288
1719	do.....	22,530	1826	do Upper.....	166,379
1720	do.....	24,434	1827	do do.....	177,174
1720	St. John Island, P.E.I.....	100	1827	Nova Scotia (Cape Breton being united in 1820).....	123,630
1721	New France.....	24,351	1827	Canada, Lower.....	473,475
1722	do.....	25,053	1828	do Upper.....	186,488
1723	do.....	26,479	1829	do do.....	197,815
1724	do.....	26,710	1830	do do.....	213,156
1726	do.....	28,396	1831	do do.....	236,702
1727	do.....	30,613	1831	Assiniboia (now Manitoba).....	2,390
1728	St. John Island, P.E.I.....	330	1831	Canada, Lower.....	553,134
1730	New France.....	32,682	1832	do Upper.....	263,554
1731	Acadia, North of Peninsula of.....	6,005	1833	do do.....	295,863
1732	New France.....	35,614	1833	Prince Edward Island.....	32,292
1733	St. John River, N.B.....	111	1834	Canada, Upper.....	321,145
1734	New France.....	37,716	1834	New Brunswick.....	119,457
1735	St. John Island.....	541			
1736	New France.....	39,063			
1737	do.....	39,970			
1737	North of Peninsula of Acadia, French population.....	7,598			
1739	New France.....	42,701			
1739	Ekoupay, River St. John.....	116			
1719	Nova Scotia, Br. Ing., &c.....	2,544			
1749	Acadian Peninsula, French pop. of.....	13,000			
1749	Ile-Royale, C.B., French pop. of.....	1,000			

CHRONOLOGICAL Record of the Population of New France, Acadia, etc.—*Con.*

Date.	Localities.	Popula- tion.	Date.	Localities.	Popula- tion.
1834	Assiniboia, Man.	3,356	1860	Canada, Upper.....	1,396,091
1835	do	3,649	1861	do Lower.....	1,111,566
1835	Canada, Upper.....	347,359	1860	New Brunswick.....	252,047
1836	do do	374,099	1861	Nova Scotia.....	330,857
1837	do do	397,489	1860	Prince Edward Island.	80,857
1837	Nova Scotia	196,906	1861	Vanconver and Victoria, B.C.,	3,024
1838	Canada, Upper.....	399,422	1861	Immigrants.....	10,586
1838	Assiniboia.....	3,966	1870	British Columbia, Immigrants and	12,228
1838	Nova Scotia	292,575	1861	descendants.....	1,620,851
1839	Canada, Upper.....	409,048	1861	Manitoba—Indians not included...	1,191,516
1840	do do	432,159	1861	Quebec.....	285,594
1840	New Brunswick.....	156,162	1870	New Brunswick.....	387,800
1840	Assiniboia	4,704	1871	Nova Scotia.....	94,021
1841	Canada, Upper.....	455,688	1871	Prince Edward Island.....	1,923,228
1841	Prince Edward Island.....	47,042	1881	Ontario.....	1,359,027
1842	Canada, Upper	487,053	"	Quebec.....	331,233
1843	Assiniboia, Man.....	5,143	"	New Brunswick.....	440,572
1844	Canada, Lower.....	697,084	"	Prince Edward Island.....	108,891
1846	Assiniboia.....	4,871	"	Manitoba.....	65,954
1848	Canada, Upper	725,879	"	British Columbia.....	49,459
1848	do Lower (estimated).....	775,000	"	North-West Territories.....	56,446
1848	Prince Edward Island.....	62,678	1890	Canada estimated at *	4,973,532
1849	Assiniboia.....	5,391			
1851	Canada, Upper.....	952,004			
1851	Nova Scotia.....	276,854			
1851	New Brunswick.....	193,800			
1851	Canada, Lower	890,261			
1855	Prince Edward Island.....	71,430			
1856	Assiniboia.....	6,691			

* Exclusive of Labrador Coast and Newfoundland.

COMPARATIVE Statement of Acadian Population in the Maritime Provinces, from 1749 to 1771, with the same in 1871.

Localities.	1749.	1755, Before the Expul- sion.	1755, After the Expul- sion.	1756.	1758, After the Cap- ture of Louis- burgh.	1765.	1771.	1871.
Nova Scotia (Peninsula).....	13,000	8,200	1,200	1,200	1,200	1,700	1,860	21,969
Cape Breton (Ile-Royale).....	1,000	3,000	3,000	2,500	700	800	920	10,864
Prince Edward Island (St. John Island).....	1,000	3,000	3,500	4,500	6,500	1,400	1,270	15,000
(District of Shediac).....	600	3,500	4,000	2,000	300	2,000	1,101	13,008
New Brunswick—								
Gulf of St. Lawrence,								
Shores.....	100	400	400	1,000	500	2,000	1,093	12,916
Baie des Chaleurs.....	100	150	150	500	400	1,000	795	9,412
St. John River.....	200	250	250	1,600	1,100	1,250	1,403	9,571
Totals.	16,000	18,500	12,500	13,300	10,700	10,150	8,442	92,740

NOTE.—Prince Edward Island, under the French régime, bore the name of "Ile St-Jean."
The Census of 1871 and 1881 includes all races then inhabiting Canada.

ABORIGINAL
OR
INDIAN POPULATION
OF
CANADA, Etc.

 ABORIGINAL POPULATION.

Localities.	Census 1871.	Census 1881.	1889.
Prince Edward Island.....	323	281	314
Nova Scotia.....	1,666	2,125	2,059
New Brunswick.....	1,403	1,401	1,574
Quebec.....	6,988	7,515	13,500
Ontario.....	12,978	15,325	17,752
Manitoba.....	(Estimated) 500	6,767	24,522
British Columbia.....	do 23,000	25,661	39,765
Labrador, Rupert's Land and North-West Territories.....	55,500	49,472	26,054
Totals.....	102,358	108,547	125,540

In 1871 and 1881 most of the population of Manitoba was included in that of the North-West Territories.

See next page for further details respecting 1889.

See also page 19 containing a statement which shows the number of Indians in 1856, according to the late Sir George Simpson who was formerly Governor of the North-West and of Rupert's Land, for the Hudson's Bay Company.

According to the census of 1871, and the memorandum therein, on the subject of the Indian population, by Dr. Charles Taché, then Deputy Minister of the Department of Agriculture, Statistics, etc., the statement above referred to, greatly overrates the Indian population. See page lxxxv of the introduction to Vol. IV of the census of 1871.

TABLE showing the number of Resident and Nomadic Indians and Denominations to which they belong.

1889.

Localities.	Unknown.	Protestant.	Roman Catholic.	Pagan.	Totals.
Province of Ontario.....	796	9,698	6,462	886	17,752
do Quebec.....	6,487	399	6,614		13,500
do Nova Scotia.....			2,059		2,059
do New Brunswick.....			1,574		1,574
do Prince Edward Island.....			314		314
do Manitoba, and N.W.T.....	1,072	7,890	6,000	9,560	24,522
Peace River District.....	238		1,800		2,038
Athabasca.....	2,000		6,000		8,000
McKenzie.....	500		6,500		7,000
Eastern Rupert's Land.....	1,173		2,843		4,016
Labrador Interior, Canadian.....			1,000		1,000
Arctic Coast.....	4,000				4,000
<i>British Columbia.</i>	16,266	17,897	41,166	10,446	85,775
West Coast Agency.....			1,852	1,241	3,093
Fraser River do.....		914	4,087		5,001
Kamloops do.....		700	1,735	125	2,560
Cowichan do.....		202	1,708		1,910
Kwaw Kwelth do.....		20	274	1,606	1,900
O'Kanagan do.....		16	735	190	941
Kootenay do.....			499		499
North-West Coast Agency.....		2,725	108	2,807	5,640
William's Lake do.....		87	1,838		1,925
<i>No Agencies.</i>		4,664	12,836	5,969	23,469
Pemberton, Douglas, Lillooet, &c. (a).....			1,600		1,600
Hiletsuck.....	2,274				2,274
Succanee.....			500		500
Tahalie (Nahannic).....	400		300	300	1,000
Bands not visited.....	8,522				8,522
Porteurs or Carrier Indians. (b).....			1,100		1,100
Chilooten Indians. (c).....			550		550
Babine do (d).....			400		400
Akwilgate do (e).....			350		350
	11,196		4,800	300	16,296
Totals.....	27,462	22,561	58,802	16,715	125,540

The above is based on the report of the Department of Indian Affairs for 1889, excepting at items a, b, c, d, e.; the classification of the Indians, however, has been modified, and their number increased at a, b, c, d, e., according to information received directly from the clergy of the Roman Catholic Dioceses.

For details respecting Labrador Indians, see following pages. See also Indians of United States. The number of Indians in the Interior of Labrador, under the Canadian Government, is estimated at 4,900 of whom 3,000 have been included in the Indian population of the Province of Quebec.

* The number of Protestant Indians at the localities marked by an "Asterisk" is not stated in the report of Indian Affairs, 1889.

† On the N.E. Coast of Labrador, under the Newfoundland Government, there are about 1,000 Moravian and 500 Roman Catholic Esquimaux, as hereinafter shown.

‡ See Volume IV, Census of 1871, which contains an elaborate statement respecting the Indian Population of Canada.

LABRADOR.

The total population of Whites, Indians and Esquimaux in 1890 is about fourteen thousand, distributed as follows :—

Localities.	Whites.	Indians.	Esquimaux.	Totals.
<i>Under the Canadian Government.</i>				
On the St. Lawrence, from Portneuf eastward to Blanc Sablon, a distance of 579 miles—Whites.....	4,484			4,484
Montagnais.....		1,600		1,600
In the Interior of Labrador, comprising 350 Naskapis, at height of land in the Roman Catholic Apostolic Prefecture of Mgr. Bossé.....		4,000		4,000
<i>Under the Newfoundland Government.</i>				
Whites.....	2,416			2,416
Esquimaux—1,000 of the Moravian missions and 500 of the Roman Catholic missions.....			1,500	1,500
Totals up to June, 1890.....	6,900	5,600	1,500	14,000

The white population residing on the north coast of the Gulf of St. Lawrence is chiefly of Canadian and Acadian origin. Apart from the traders and the persons employed in their establishments, the others live by fishing and hunting, and the great majority speak both English and French.

Upwards of 600 of them are Protestants, and the remainder are chiefly Roman Catholics.

INDIANS OF THE INTERIOR.

The Indians of the Interior are the Montagnais and the Naskapis ; they speak dialects of the Cree language and number about 4,000. They are slowly disappearing ; the game on which they depend is becoming scarcer every year, owing to destructive fires.

They are scattered throughout the Anglican Dioceses of Quebec and Moosonee and the Roman Catholic Diocese of Chicoutimi, the Apostolic Prefecture of the Gulf of St. Lawrence and portion of the Apostolic Vicariate of Pontiac.

Some of the Naskapi tribe are still heathen, but the Montagnais are nearly all Roman Catholics.

INDIANS ALONG THE COAST.

The nomadic tribes of Indians along the coast, from Portneuf and Blanc Sablon, and in the Interior are branches of the great Algonquin race, whose area once extended from the Rocky Mountains to Newfoundland and from Labrador to the Carolinas, and are known as the Montagnais or Mountaineers, the Mistassini and the Swampy Creek Indians.

The Jesuit missionaries of early times extended their labours from Canada to Labrador, and were specially successful among the Montagnais.

The Roman Catholic missions, from Portneuf to Blanc Sablon and of a portion of the interior, were placed under the jurisdiction of Mgr. Bossé, who was appointed Prefect Apostolic thereof, 29th May, 1882.

His headquarters are at Pointe-aux-Esquimaux, 477 miles below Quebec, 344 below Tadoussac, 299 below Portneuf, and 280 westward of Blanc Sablon.

The white inhabitants of the Atlantic coast, from Blanc Sablon to Cape Webeck or Harrison, above Hamilton Inlet or Baie du Rigolet, 2,416 persons in all, are chiefly British sailors or their descendants, who prefer a rude, lonely, semi barbarous life to the restraints of civilization. Salmon and cod fishing is their main occupation, and the products of their industries are exchanged with traders, on the spot, for such commodities as they require. The winter is spent in trapping fur-bearing animals. At the various mercantile establishments along the coast, a number of book-keepers, clerks, servants and others, are resident.

Out of the 2,416, 1,489 belong to the Church of England; 486 to the Church of Rome, 285 are Wesleyans, 30 are Presbyterians, and 126 belong to other denominations.

There are nine places of worship: 4 Anglican, 3 Roman and 2 Wesleyan.

During the fishing season, a steamer, carrying mails and passengers, plies fortnightly on the coast, connecting with the Newfoundland coastal steamer at Battle Harbour.

ESQUIMAUX POPULATION.

Northern Labrador, from Cape Webeck or Cape Harrison to Cape Chudleigh, is the proper home of the Esquimaux of this region. They call themselves "Innuits," which means "men,"—the term Esquimaux ("eaters of raw flesh") being applied to them by hostile tribes from the west.

They are of low stature, with coarse features, small hands and feet and black wiry hair. The men are expert in fishing, catching seals, and managing the light and graceful boat called the "Kayak," which outrides the rudest surges of the sea; the women are skilful in making garments from skins.

It is estimated that the Esquimaux of Labrador number about 1,700 souls, scattered along 500 miles of coast.

For more than a century the Moravian missionaries have been labouring amongst them, and with such success that nearly all of them have been reclaimed from heathenism of the worst description and brought under Christian training.

The practice of polygamy has ceased among them, and they have become, to a large extent, peaceful and industrious, and are weaned from the wandering life to which they were addicted, living around the mission stations in winter and at the fishing posts in summer.

The Moravian missionaries trade with them and export the products of their labours, giving them necessaries and comforts in exchange. Once a year a missionary ship arrives laden with provisions and stores of all kinds, and carries a return cargo of furs, fish, oil, etc.

The brethren have four stations:—Hopedale, Nain, Ok-kak and Hebron. At each station there is a church, store, dwelling house for the missionaries, and workshops for the native tradesmen.

Nain, the principal mission, where 200 of the Esquimaux generally reside, is about 410 miles above Belle-Ile and 350 below Cape Chudleigh; Hopedale is south of Nain; Ok-ak is about two-thirds of the way to Hebron; the latter is about midway between Nain and Cape Chudleigh.

In seasons of famine food is freely distributed from the mission stores.

About twenty missionaries are resident on this savage coast. The hardships they have to endure may be estimated from the fact that the mean annual temperature at Nain is $22^{\circ}.52$ Fahrenheit, and at Ok-kak $27^{\circ}.82$. The thermometer marks 75° occasionally in summer, while spirits freeze in the intense cold of winter.

Along Hudson's Strait, or for a distance of 500 miles from Cape Chudleigh to Nottingham Island, at the entrance to Hudson's Bay, the number of Esquimaux is estimated as not exceeding 1,500.

The men generally measure from 5 feet 2 inches to 5 feet 8 inches, and the women from 4 feet 10 inches to 5 feet $1\frac{1}{2}$ inches. Their families generally consist of two children. They die most frequently of lung diseases.

They live by hunting and generally by fishing. Each family is generally provided with dogs and sledges, and kayaks (canoes), which they handle with great dexterity. Except in the Alaska, Mackenzie and Copper-Mine regions, where they are aggressive towards white men and the Indians of other tribes, they are of a very peaceable disposition and very kind towards their wives.

They live under tents of deer skin or seal skin, or in huts excavated in the ground or made of snow and ice. Their favourite clothing is of seal skin.

POLAR SEA AND ARCTIC ARCHIPELAGO.

They are found along the coast of the Polar Ocean, from Behring Sea to Dease Strait, and thence in the Arctic Archipelago at Prince William's Island, at Boothia Felix and at Igloolik, near the 70th degree of north latitude and 81st degree of west longitude. They have a settlement at Ka-pa-rok-to-lik, near Eclipse Sound, near the $72\frac{1}{2}$ nd degree of north latitude and 78th degree of longitude.

Their remotest permanent settlement is at Etah, in latitude $77\frac{1}{2}$ degrees and longitude $72\frac{1}{2}$ degrees, on the Greenland coast of Smith's Sound. Greely, in 1882, found traces of their migratory encampments up to and beyond the 80th parallel of latitude.

From Etah, southward, they are found along the Greenland coast of Baffin Sea and Davis Strait, and at various fishing settlements.

Their total number has not been ascertained.

From Portneuf, westward, to Tadoussac, a distance of 344 miles, the population is estimated at about 3,500, chiefly whites. The Roman Catholic Missions along this part of the coast, and up the Saguenay to Lake St. John and its surroundings, where the country is more densely settled, are in the diocese of Mgr. Bégin, who resides at Chicoutimi.

The remainder of the region from the Labrador and Chicoutimi districts to the Archdiocese of St. Boniface are under Mgr. Lorrain.

The Anglican Missions along the north shore of the St. Lawrence from Tadoussac down to Blanc Sablon are under Bishop J. W. Williams, and those on the Atlantic Coast of Labrador under Bishop L. Jones, of Newfoundland.

The Hudson's Bay region is under Bishop J. Horden, whose diocese is called Moosonee.

The remainder of the Roman Catholic missions westward from the Hudson's Bay region are under the jurisdiction of the Roman Catholic Archbishop Taché, Mgr. Grandin and Mgrs. Faraud and Clut, as far as the Rocky Mountains. The Anglican missions in the same territory are under Bishop Sullivan, Machray, Anson, Pinkham, Young and Bompas.

West of the Rocky Mountains in British Columbia the Indian missions are situated in the Roman Catholic diocese of Mgrs. d'Herbomez, Durieu and Lemmens; and in the Anglican corresponding dioceses of Bishops Hill, Sillitoe and Ridley.

The Indian population in the above named regions is shown on the general tabular statement based chiefly on the last report of the Indian Department; it numbers 125,540 so far as reported, and includes most of the Indians in the Province of Quebec and elsewhere so far as ascertained.

INDIAN Tribes of the Hudson's Bay Territories.

Names and Location.	Estimated Population Prior to July, 1857.
<i>West of the Rocky Mountains.</i>	
Koolooch Group, comprising 13 Tribes	45,000
Athabaskan Group, comprising 13 Tribes on both sides of the Rocky Mountains.....	35,000
	80,000
<i>East of the Rocky Mountains.</i>	
Blackfoot and Sioux, comprising 3 Tribes.....	30,000
Algonquin Group, comprising 12 Tribes.....	17,570
<i>Esquimaux.</i>	
No return of Numbers, estimated at.....	8,000
<i>Estimated Population of Territory.</i>	
East of the Mountains.....	55,570
West do as above.....	80,000
Total.....	135,570

See report of the Select Committee on the Hudson's Bay Company, ordered to be printed by the House of Commons, England, 31st July and 11th August, 1857.

LIST of the Missionaries of the Roman Catholic Church in the Canadian North-West.

1818—Mgr. J. N. Provencher. Sevère Dumoulin.	1854—Brother Bowes.
1820—Th. Destroismaisons.	1855—Rev. F. J. M. J. Lestanc.
1822—Jean Harper.	1857—Rev. F. Lefloch.
1827—Fr. Boucher.	Brother Clut, now auxiliary of Bishop Faraud
1831—G. A. Belcourt.	Brother Salasse.
1832—Ch. Ed. Poiré.	Brother Perreard.
1833—J. B. Thibault, Vic. Gen.	Rev. F. Frain.
1837—M. Demers, late Bishop of Vancouver.	Rev. F. Eynard.
1838—Jos. Ars. Mayrand.	Brother Kearney.
1841—Jos. E. Darveau.	} They came on one of the Hudson's Bay Co. steam- ers. This Co. gave them free passage from Lon- don to York Factory.
1844—L. Lafleche, now Bishop of Three Rivers.	
Jos. Bourassa.	Mons. Gascon, priest.
1845—Rev. Father Aubert.	1858—Rev. F. Mestre.
Brother Taché, now Bishop of Manitoba.	Rev. F. Moulin.
1846—Rev. F. F. X. Bermond.	Brother Cunningham.
Brother Henry Faraud, now Bishop of Atha- basca.	1860—Rev. F. Seguin.
Brother Louis Dubé.	Rev. F. Caer.
1848—Rev. F. A. Maisonneuve.	Rev. F. Gasté.
Brother F. J. Tissot.	Mons. Oram.
1849—Rev. F. J. Tissot (same as above, ordained priest.)	Brother Boisramé.
1852—Rev. F. H. Grollier.	Rev. F. L. Simonet.
Rev. F. Lacombe.	Brother Glénat.
Rev. F. Remas.	1861—Rev. F. Richer.
Rev. F. Végreville.	Rev. F. André.
Brother A. Raynard.	1862—Rev. F. Petitot.
1854—Rev. F. Vital Grandin, now Bishop of St. Albert.	Brothers Scallen and Duffy.
	MM. Ritchot and Germain.
	M. Emile Girouard.
	1865—Rev. Fathers Genin, Tissier and Leduc.
	Brothers Lalican, Hand and Mooney.

NOTE.—Prior to the nineteenth century we know of two missionaries who contributed to the discovery of those remote parts of Canada. They are Rev. Father Messager who accompanied the famous discoverer Varennes de la Vérandrye, in 1731, and Rev. Father Aunau, who was killed on an island of Lac de la Croix (Cross Lake) by the Sioux in 1736; he was accompanying one of the sons of La Vérandrye, who was also killed with all his companions.

INDIAN POPULATION

OF THE

UNITED STATES OF NORTH AMERICA.

INDIANS—United States of North America.

PRIOR TO JULY, 1857.

STATEMENT of the Number of Indians East of the Mississippi:—

Chippewas, Ottawas and Potawatomes.	8,000
Chippewas.	6,800
Indians in New York	4,500
do from do at Green Bay	725
Menomonies	4,200
Miamis	1,200
Ottawas and Chippewas of L. Michigan.	530
Penobscots, in the State of Maine.	441
Passamaquoddies do	400
	<u>26,796</u>

STATEMENT of the Number of Indians who have been removed from the East to the West of the Mississippi:—

Creeks	25,000
Choctaws	18,500
Cherokees	15,000
Chickasaws	5,400
Winnebagoes	4,600
Seminoles	3,000
Potawatomes	1,540
Shawnese	1,250
Delawares	826
Wyandots	623
Kickapoos	470
Weas	282
Senecas from Sandusky	251
do and Shawnese	211
Ottawas	200
Piankeshaws	162
Peorias and Kaskaskias	132
	<u>77,447</u>

STATEMENT of the Number of Indians, natives of the Country West of the Mississippi and East of the Rocky Mountains:—

Crows	45,000
Blackfeet	30,000
Sioux and Teton	27,500
Mandans	15,000
Minetarees	15,000
Pawnees	10,000
Assiniboins	8,000
Cumanchees	7,000
Osages	5,120
Sacs	4,800
Crows	3,000
Gros Ventres	3,000
Aricaras	3,000
Chayennes	2,000
Foxes	1,600
Ottoes	1,600
Kansas	1,470
Omahas	1,400
Ioways	1,200
Caddoes	800
Pancas	800
Sacs of the Missouri	500
Quapas	450
Arapahays	25,000
Keewas	
Ayutans	
Kanivavish	
Kaskayas	
Padoucas, &c	
	<u>213,240</u>

The number of Indians residing West of the Rocky Mountains in 1820, according to the report of a Commissioner of the United States on Indian Affairs, amounted to 171,200.

See Report from the Select Committee on the Hudson's Bay Company, ordered to be printed by the House of Commons, England, 31st July and 11th August, 1857.

INDIAN Population in the United States of North America, by Agencies.
(From the Report of the Honourable Commissioner of Indian Affairs, U. S., for 1886.)

Name of Agency.	Number.	Total.
<i>Arizona.</i>		
Colorado River Agency.....	2,527	
Pima do	1,050	
San Carlos do	4,977	
Indians in Arizona, not under an Agent.....	914	9,468
<i>California.</i>		
Hoop Valley Agency	422	
Mission do	3,096	
Round Valley do	608	
Yule River do	681	
Indians in California, not under an Agent	6,456	
Klamaths.....	213	11,476
<i>Colorado.</i>		
Southern Ute Agency		978
<i>Dakota.</i>		
Cheyenne River Agency.....	2,965	
Crow Creek and Lower Brulé Agency.....	2,274	
Devil's Lake Agency.....	2,182	
Fort Berthold do	1,322	
Pine Ridge do	4,873	
Rosebud do	8,291	
Sisseton do	1,496	
Standing Rock do	4,690	
Yankton do	1,776	29,869
<i>Idaho.</i>		
Fort Hall Agency.....	1,444	
Lemhi do	557	
Nez Percé do	1,460	
Indians in Idaho, not under an Agent.....	600	4,061
<i>Indian Territory.</i>		
Cheyenne and Arapahoe Agency.....	3,434	
Koowa, Comanche and Wichita Agency.....	4,182	
Osage do	1,905	
Ponca, Pawnee and Otoe do	1,968	
Quapaw do	1,049	
Sac and Fox do	2,261	
Union do	61,000	75,799
<i>Iowa.</i>		
Sac and Fox Agency.....		380
<i>Kansas.</i>		
Pottawatomie and Great Nemaha		1,007
<i>Michigan.</i>		
Mackinac Agency.....		7,313
<i>Minnesota.</i>		
White Earth Agency		6,038
<i>Montana.</i>		
Blackfeet Agency.....	2,026	
Crow do	3,226	
Flathead do	2,280	
Fort Belknap Agency.....	1,650	
Fort Peck do	2,917	
Tongue River do	795	12,894

INDIAN Population of the United States of North America, &c.—*Concluded.*

Name of Agency.	Number.	Total.
<i>Nebraska.</i>		
Santee and Flandreau Agency.....	1,312	3,694
Omaha and Winnebago do	2,382	
<i>Nevada.</i>		
Nevada Agency.....	4,558	8,238
Western Shoshone Agency	3,680	
<i>New Mexico.</i>		
Mescalero Agency.....	1,202	28,241
Navajo do	19,277	
Pueblo do	7,762	
<i>New York.</i>		
New York Agency.....		4,963
<i>North Carolina.</i>		
Eastern Cherokee in North Carolina and Tennessee.....		3,000
<i>Oregon.</i>		
Grande Ronde Agency.....	510	4,647
Klamath do	972	
Siletz do	612	
Umatilla do	894	
Warm Springs do	859	
Indians in Oregon, not under an Agent.....	890	290
<i>Texas.</i>		
Indians in Texas, not under an Agent.....		
<i>Utah.</i>		
Ouray Agency.....	1,252	2,698
Nintah do	1,056	
Indians in Utah, not under an Agent.....	390	
<i>Washington.</i>		
Colville Agency.....	3,150	10,579
Neah Bay do	781	
Quinalt do	423	
Nesqually and Skokomish Agency.....	1,712	
Tulalip Agency	1,223	
Yakima do	3,290	
<i>Wisconsin.</i>		
Green Bay Agency.....	3,000	8,006
La Pointe do	3,796	
Indians in Wisconsin, not under an Agent	1,210	
<i>Wyoming.</i>		
Shoshone Agency.....		1,800
MISCELLANEOUS.		
Miami and Seminole in Indiana and Florida.....	892	1,392
Oldtown Indians in Maine.....	410	
Total.....		235,263

See J. B. Harrison's Indian Reservations.

PART II.

NAVIGABLE WATERS.

CANALS.

RAILWAYS.

COMPARISON OF ROUTES—LIVERPOOL TO JAPAN.

GOVERNMENT TELEGRAPH LINES AND CABLES.

ST. LAWRENCE NAVIGATION.

DISTANCES.

FROM STRAIT OF BELLE-ILE TO DULUTH, AT HEAD OF LAKE SUPERIOR.

From	To	Sections of Navigation.	Statute Miles.	
			Inter- mediate.	Total to Strait of Belle-Ile.
Straits of Belle-Ile.....	Cape Whittle.....	Gulf of St. Lawrence.....	240	240
Cape Whittle.....	West Light, Anticosti.....	do.....	201	441
West Light, Anticosti.....	Father Point.....	River St. Lawrence.....	203	643
Father Point.....	Rimouski.....	do.....	6	649
Rimouski.....	Bic.....	do.....	12	661
Bic.....	Ile-Verte.....	do.....	39	700
Ile-Verte (opp. Saguenay).....	Quebec.....	do.....	126	826
Quebec.....	Three Rivers.....	do to Tide-water.....	74	900
Three Rivers.....	Montreal.....	do.....	86	986
Montreal.....	Lachine.....	Lachine Canal.....	84	994½
Lachine.....	Beauharnois.....	Lake St. Louis.....	15½	1,009½
Beauharnois.....	Ste-Cécile.....	Beauharnois Canal.....	11½	1,021
Ste-Cécile.....	Cornwall.....	Lake St. Francis.....	32½	1,053½
Cornwall.....	Dickinson's Landing.....	Cornwall Canal.....	11½	1,065½
Dickinson's Landing.....	Farran's Point.....	River St. Lawrence.....	5	1,070½
Farran's Point.....	Upper end Croyle's Island.....	Farran's Point Canal.....	½	1,071
Upper end Croyle's Island.....	Williamsburg or Morrisburg.....	River St. Lawrence.....	10½	1,081½
Williamsburg.....	Rapide-Plat.....	Rapide-Plat Canal.....	4	1,085½
Rapide-Plat.....	Point Iroquois Village.....	River St. Lawrence.....	4½	1,090
Point Iroquois Village.....	Upper end Presqu'île.....	Point Iroquois Canal.....	3	1,093
Presqu'île.....	Point Cardinal, Edwardsburg.....	Junction Canal.....	2½	1,095½
Point Cardinal.....	Head of Galops Rapids.....	Galops Canal.....	2	1,097½
Galops Rapids.....	Prescott.....	River St. Lawrence.....	7½	1,105
Prescott.....	Kingston.....	do.....	59	1,164
* Kingston (See note).....	Port Dalhousie.....	Lake Ontario.....	170	1,334
Port Dalhousie.....	Port Colborne.....	Welland Canal.....	27	1,361
Port Colborne.....	Amherstburg.....	Lake Erie.....	232	1,593
Amherstburg.....	Windsor.....	River Detroit.....	18	1,611
Windsor.....	Foot of St. Mary's Island.....	Lake Ste-Claire.....	25	1,636
Foot of St. Mary's Island.....	Sarnia.....	River Ste-Claire.....	33	1,669
Sarnia.....	Foot of St. Joseph's Island.....	Lake Huron.....	270	1,939
Foot of St. Joseph's Island.....	Foot of Saut-Ste-Marie.....	River St. Mary.....	47	1,986
Saut-Ste-Marie.....	Head of Saut-Ste-Marie.....	Saut-Ste-Marie Canal.....	1	1,987
Head of Saut-Ste-Marie.....	Pointe-aux-Pins.....	River St. Mary.....	7	1,994
Pointe-aux-Pins.....	Duluth.....	Lake Superior.....	390	2,384

Duluth is 124 miles South-West of Port Arthur, formerly called "Prince Arthur's Landing."

Of the 2,384 miles from the Strait of Belle-Ile to the head of Lake Superior, 71½ miles are artificial navigation and 2,312½ open navigation.

Straits of Belle-Ile to Liverpool, 1,942 geographical, or 2,234 statute miles.

The total ascent from tide-water to Lake Superior is assumed to be not less than 602½ feet above tide-water at Three Rivers, and 601.78 above tide-water at New York, according to the most recent information obtained up to the 7th April, 1883.

For details respecting the various sections of rivers and canal navigation, viz.:—The intermediate and total distances; the intermediate and total rise above tide water; the dimensions and depth of each canal, and of each lock, &c., on the St. Lawrence route of navigation and its tributaries, &c., see tabulated profiles Nos. 4, 5, 13, 14, 15, 39 of Appendix No. 30 of General Report on Public Works, 1867 to 1882, and new Table of Canals further on.

For dates of opening and closing of navigation, see Appendix No. 19. Report P. W., 1886-87.

* The Murray Canal, between Weller's Bay and Bay of Quinté, is not on the direct line of navigation, and is for the use of coasting navigation in the locality.

Draught of Water—St. Lawrence Navigation.

Sections of Navigation.	Minimum depth available in 1890.	Depth when work now in progress, is completed.
	Feet.	Feet.
Dredged Channel—Quebec to Montreal—In progress	25 to 27.5	27.5
Lachine Canal—Enlargement completed.....	12	14
Beauharnois Canal—To be enlarged or another canal to be constructed on north shore opposite.....	9	14
Cornwall Canal—Enlargement commenced in 1876—In progress	9	14
Williamsburg Canals—Enlargement commenced in 1884—In progress.....	9	14
Murray Canal—Completed—Not on main line of navigation.....	10	10
Burlington Bay Canal—Not on main line of navigation.....	10	10
Welland Canal—Enlargement completed—Deepening to 14 ft. completed....	14	14
Saut-Ste-Marie Canal—State of Michigan—Enlargement completed.....	16.8	18.8
do Canada—Work commenced, 1888.....		

NOTE.—See Canals, further on.

The dredged channel from Montreal down to Cap-à-la-Roche, is finished to a depth of 27½ feet.

At the latter place and at Cape Charles, the channel will be finished to the same depth, probably towards end of 1891.

LAKE NAVIGATION.

LAKE SUPERIOR TO THREE RIVERS.

Names of Lakes, and of Rivers, connecting the same.	STATUTE MILES.			DEPTH IN FEET.		Area in Square Miles.	Estimated Elevation above Sea, at Three Rivers.
	Greatest Length.	Greatest Breadth.	Average Breadth.	Greatest.	Mean.		
Superior	390	160	80	900	31,420	602½	
St. Mary's River.....	35	4	1	60	30	584½	
Michigan.....	345	84	58	1,000	25,500	578½	
Green Bay.....	100	25	18	500		578½	
Mackinaw Straits.....	Not added below.	20	10	200	40	578½	
Georgian Bay.....		55	40	500	23,780	576½	
Huron.....	270	105	70	900	450	576½	
St. Claire River.....	33			50	35		
St. Claire Lake.....	25	25	20	27	15	360	570½
River Detroit.....	25	3	1	37	20		
Lake Erie.....	250	60	38	204	90	10,030	566½
Niagara River.....	35	3	1		30		
Lake Ontario.....	190	52	40	600	412	7,330	240
Lake St. Francis.....	38	5	4	80	36	132	142
Lake St. Louis.....	15	7	5	68	30	75	58
Lake St. Peter.....	30	9	7	40	8	200	0
River St. Lawrence, connecting Lakes between Kingston and Three Rivers.....	186				20		
Total length of Lake Navigation	2,112	Inclusive of River portions.....			98,917		
do	1,778	Exclusive of River portions.....					

PRINCIPAL Lakes in the Provinces, Districts and Territories of Canada.

Name of Lakes.	Length in Miles.	Mean Breadth in Miles.	Area in Square Miles.	Depth in Feet.	Elevation above the Sea in Feet.	Remarks.
Abitibi, N.W.T.	60	3 to 15	512	20	857	245 feet above Lake Temiskaming.
Ainslie, C.B., N.S., discharges into the Margarie.	15	3	30	30	.....
Athabasca, N.W.T.	200	20 to 40	4,400	Deep, except at west end.	About 600	
Bear, Great N.W.T.	250	Max. 185	11,200	Over 270	200	Elevation given by Dr. Richardson, Franklin Exp.
Bras-d'Or, C.B., N.S.	60	1 to 48	570	30 to 360	3 to 4 at low tide.	An arm of the sea.
Champlain, Q. & U.S.	130	$\frac{1}{2}$ to 10	430	50 to 280	.....
Erie, O.	250	Max. 60 Mean 38	10,030	Max. 204 Mean 90	567	
Grand, N.B.	25	3 to 6	84	.....	.....
Great Slave, N.W.T.	390	50	10,100	Deep as Lake Superior.	391	150 feet above the Mackenzie, at Fort Simpson.
Huron, O.	270	Max. 105 Aver. 70	23,780	Mean 450 Max. 900	576 $\frac{1}{2}$	
Kootenay, B.C. ....	.....	.....	.....	.....	.....
Little Slave, Athabasca District.	65	1 to 12	500	.....	1,800	
Long Lake, Assiniboia District.	40	3	.....	300 to 400	.....
Manitoba, Man.	122	Max. 24	1,850	.....	670	According to Prof. H. Y. Hind.
Michigan, U.S.	345	58	25,590	800 to 1,000	578 $\frac{1}{2}$	
Mistassini, N.E.T.	92	.....	2,000	.....	.....
Nipigon, O.	60 to 70	40 to 50	1,450	A 540-foot line found no bottom.	1,416	813 feet above Lake Superior.
Nipissing, O.	40 to 50	20 to 35	300	.....	665	
Ontario, O.	190	Max. 52 Mean 20	7,330	Over 600 Mean 412	240	
Rossignol, N.S.	11	4 to 6	40	.....	.....
St. John, Q.	28	17 to 20	365	3 to 225	278	Per A. L. Light in 1880
Simcoe, O.	30	18	300	.....	701 $\frac{1}{2}$	do Baird.
Superior, O.	390	Max. 160 Mean 80	31,420	480 to 1,200 Mean 900	603	
Temiskaming, Q.	75	1 to 10	113	The deepest lake on the Ottawa.	612	
Winnipeg, Man.	260	5 to 65	9,400	42 to 90	628	According to Prof. H. Y. Hind.
Winnipegosis, Man.	130	27	2,030	10	692	do do
Woods, Lake of the.	75	60	1,500	.....	1,000	Circumference 300 m.

N.B.—About one-half of Lakes Ontario, Erie, Huron and Superior belong to the United States of America.

NAVIGABLE WATERS—Manitoba and North-West Territories—between Winnipeg and Mouth of Mackenzie at Polar Ocean, North-Westward; and between Winnipeg and Fort McLeod, South-Westward.

Names of Rivers and Lakes.	Length.	Width.	Depth.	Remarks.
	Miles.	Miles.	Feet.	
Lake Winnipeg, about 40 miles north of Winnipeg.	260	5 to 65	42 to 90	Below St. Andrew's Rapids, Red River, and on Lake Winnipeg, there are the "Princess Royal" and "Colville," 6 ft. draught; the "Red River," 5 ft., and the "Anora," 6½ ft.; 1 schooner and 10 barges of 6 ft. draught.
Lakes Manitoba and Winnipegosis.	252	3 to 15	.....
Red River (within Manitoba), during ordinary seasons, is navigable up to head at Goose Rapids, 220 m. above Winnipeg, on a direct line.	100	900	8 to 2½	The "Antelope," of 3 ft. draught, is the only steamer in 1890 running above St. Andrew Rapids; the "Anson Northup," the first steamer, commenced running in 1859.
Assiniboine River.....	350	150	3 to 4	No steamer since 1883, on account of shoals at St. James' Rapids, 2 miles above Winnipeg.
Souris River (probable)....	120	100	2 to 3½	
Qu'Appelle River and Lakes	290	70 to 100	2 to 4½	The "Lily," and another steamboat belonging to the Hudson Bay Co. have been running on the river up to Edmonton since 1877. (See remark below respecting the North Saskatchewan.)
Long Lake, Assiniboia Dist.	40	.....	.....
Main Saskatchewan to the Forks.	332	800 to 1,000	2½ to 3½	Steamer "Athabasca," Hudson Bay Co., to Grand Rapids, above Fort McMurray.
North Saskatchewan, Forks to Edmonton.	481	800 to 1,000	2½ to 3½	
South Saskatchewan, from the Forks.	700	750 to 2,000	5 to 8	Steamer "Graham," Hudson Bay Co., descends to Lake Athabasca at Chipewyan, and thence to the Fort Smith Portage, which is about 14 miles in length; this steamer also ascends a portion of the Peace River.
Athabasca River, from the Landing to Grand Rapids, of 83 miles in length.	168	800	2½ to 3½	
Athabasca River, from Fort McMurray to Fort Chipewyan, Lake Athabasca.	194	800	7 to 8	The steamer "Wrigley," belonging to the Hudson Bay Co., calls at all the trading posts with supplies, and collects all the furs for the company from Fort Smith, at the foot of the rapids or portage, on Great Slave River, down to Fort McPherson, on the Peel River, the junction of which is about 67 miles above the mouth of the Mackenzie; she also plies on the lower portions of the Peace and Liard Rivers; her speed is 10 miles an hour descending, and 6 miles an hour up stream.
Athabasca Lake.....	200	5 to 30	7 to 8	
Fort Chipewyan to Fort Smith Portage.	102	.....	7 to 8	Depth. 390
Peace River (tributary)....	700	.....	7 to 8	
Fort Smith Portage to Fort Resolution, on S. side of Great Slave Lake.	190	.....	7 to 8	Shoalest portions.
Fort Resolution, across Great Slave Lake to Fort Providence.	167	.....	7 to 8	
Great Slave Lake.....	300	10 to 60	8 to 12	Depth. 390
Mackenzie River, from Fort Providence to Polar Sea.	1,009	¼ to 1½	8 to 12	

REMARK.—The North Saskatchewan is navigable for boats or barges from Mountain House to Edmonton, 150 miles, and from Edmonton by steamboats for about two months down to Carlton House, about midway to Lake Winnipeg. Navigation is interrupted at 50 miles below Carlton House, and also below Cedar Lake (Lake Bourbon), towards Lake Winnipeg, for some miles at each place. The draught of water is generally 2½ to 3½ feet, but in very low stages of the water, it is scarcely more than 18 inches. For further particulars, see following table and remarks.

TABLE of approximate distances between various points, from Mouth of Red River, at Head of Lake Winnipeg, down to Grand Rapid, at Mouth of the North or Main Saskatchewan, towards foot of Lake, and thence along the Saskatchewan up to Fort Edmonton, as per map, Department of Interior, published in 1887.

Names of Localities.	Inter- mediate distances.	Total distances from Mouth of Red River
<i>Lake Winnipeg.</i>		
1. Mouth of Red River to Mouth of Saskatchewan, or from Head of Lake Winnipeg down to Grand Rapid towards Foot of Lake.....	220	220
<i>North or Main River Saskatchewan.</i>		
2. Mouth of Saskatchewan, on Lake Winnipeg, at Grand Rapid up to Foot of Cedar Lake.....	20	
3. Foot to Head of Cedar Lake.....	30	
4. Head of Cedar Lake to Cumberland House.....	115	
5. Cumberland House to Tobin's Rapids.....	52	
6. Tobin's Rapids to Fort à la Corne.....	92	
7. Fort à la Corne to Forks, North and South Saskatchewan.....	14	
8. Forks of Saskatchewan to Cole's Rapid.....	9	
9. Cole's Rapid to Carlton House.....	71	
10. Carlton House to Battleford, on original Pacific Railway Line.....	110	
11. Battleford to Fort Pitt.....	95	
12. Fort Pitt to Fort Saskatchewan.....	185	
13. Fort Saskatchewan to Fort Edmonton.....	20	
Total from Mouth of Red River to Fort Edmonton, at about 30 miles above intersection of original Pacific Railway Line.....		813
		1,033

See pages 392 to 395, Note A, Appendix No. 8 of General Report on Public Works, 1867 to 1882.

REMARKS.

The navigation between the mouth of Red River and Fort Edmonton is performed by three steamers of the Hudson's Bay Company, one of which plies between Red River and Grand Falls, near Lake Winnipeg. These falls are impassable for vessels. Here the Company has built a tramway, about four miles in length, to overcome the falls, which involves the transshipment of passengers and freight.

A second steamer runs from the head of the falls to the rapid 50 miles below Carlton House, or about 353 miles.

A third steamer completes the journey, thence to Fort Edmonton, about 460 miles.

The entire journey of 1,033 miles is said to occupy a fortnight.

The depth available during low water is said to be from $1\frac{1}{2}$ to $3\frac{1}{2}$ feet.

For distances from Prince Arthur's Landing to Winnipeg and westward Canadian Pacific Railway—See tables of Appendix No. 30, Parts III and General Report on Public Works, 1867 to 1882.

There are no steamers on the Assiniboine River since 1883. This river has not been navigable since that date owing to low water at St. James' Rapids about two miles above Winnipeg; its average width is about 75 yards and its average depth about 4 feet in low water, but this frequently changes, as the bed of the river is mostly composed of sand, and where the flow of the river is rapid there are many sand bars, which are continually changing.

The "Antelope," 3 feet draught of water, is the only steamer running on Red River this side of St. Andrew's Rapids.

Below St. Andrew's Rapids and on Lake Winnipeg there are: the "Princess," 6 feet draught of water; the "Colville," 6 feet draught; the "Red River," 5 feet draught; the "Aurora," 6½ feet draught; one schooner 6 feet draught, and eight or ten barges, 6 feet draught each.

The average width of the Red River is about 300 yards. The depth varies greatly. From mouth of this river to St. Andrew's Rapids—29 miles—it averages 8 feet; from head of rapids to Winnipeg—10 miles—4 feet, and from this last point to head of navigation, at Goose Rapids, a distance, in a direct line, of 220 miles and 450 by water, it averages 2½ to 3 feet.

The St. Andrew's Rapids are 11 miles long at low water. During ordinary seasons the Red River is navigable from Lake Winnipeg to Goose Rapids, with the exception of the St. Andrew's Rapids.

The average depth of Lake Winnipeg varies from 7 to 15 fathoms. At Grand Rapids, at the boat landing, the depth of lake is 7 to 8 feet.

See letter of D. Smith, Clerk of Works, Manitoba, 14th May, 1890, No. 108,688, to G. F. Baillairgé, Deputy Minister of Public Works, Ottawa.

RIVER SASKATCHEWAN.

Approximate estimate of the number of cubic feet of water passing down the South Branch, the North Branch, and the Main Saskatchewan.

	Cubic Feet per Second.	Cubic Feet per Minute.	Cubic Feet per Hour.
South Branch	34,285	= 2,057,094	= 123,425,616
North Branch	25,281	= 1,516,866	= 91,011,360
Main Saskatchewan, at Fort à la Corne	59,567	= 3,574,021	= 214,441,290
do near Deering River.	57,493	= 3,449,583	= 206,975,000

For particulars respecting the Saskatchewan, *see* pages 392 to 395 of General Report on Public Works, 1867 to 1882.

For further particulars about the Saskatchewan River, *see* the Report made by Prof. H. Y. Hind, and published by order of the Legislature of Canada, 1859.

CANALS OF CANADA.

Names.	No. of Locks	Length of Locks in feet.	Breadth of Locks in feet.	Depth of Water on Sills in feet.	Length in Statute Miles.
<i>River St. Lawrence and Lakes.</i>					
Saut Ste. Marie—Being constructed on St. Mary's Island, on N. side of rapids, between Lake Huron and Lake Superior.....	1	600	85	18	1
Welland Canal—(Enlargement completed).....	27	270	45	14	26½
do River Branches.....	2	150	26½	9½	21
do Grand River Feeder.....	2	200, 150	45, 26½	9	1½
do Port Maitland Branch.....	1	185	45	11	1½
Burlington Bay—No locks: channel.....			103	11	
Murray Canal do do.....			80	11	5½
Calops Canal—Being deepened to a navigable depth of 14 feet on lock sills.....	3	200	45	9	7½
Rapide Plat Canal—Being deepened to a navigable depth of 14 feet on locks sills.....	2	200	45	9	4
Farran Point Canal—Being deepened to a navigable depth of 14 feet on lock sills.....	1	200	45	9	2
Cornwall Canal—Being deepened to a navigable depth of 14 feet on locks sills.....	6	4-200; 2-270	45	9	11½
Beauharnois Canal—To be enlarged or a new canal built, with a navigable depth of 14 feet on sills.....	9	200	45	9	11½
Lachine Canal—(Enlargement completed).....	5	270	45	14	8½
<i>The River Ottawa.</i>					
St. Ann's Lock.....	1	200	45	9	1
Grenville Canal.....	5	200	45	9	5½
Chute à Blondeau Canal—Not used since construction of Carillon Canal and dam 1,781 feet long across the Ottawa.	1	130	32	6	1
Carillon Canal.....	2	200	45	9	1
Culbute Canal—Upper Ottawa River—Locks of wood; aggregate length of dams 625 feet.....	2	200	45	5	
<i>Rideau Navigation—Ottawa to Kingston.</i>					
Rideau Canal—33 locks ascending, 14 locks descending..	47	134	33	4½ to 5	126½
River Tay Canal.....	2	134	32	5½	6
<i>River Richelieu and Lake Champlain.</i>					
St. Ours Lock and Dam.....	1	200	45	7	1
Chamblé Canal.....	9	122 to 125	22½ to 24	7	12
<i>River Yamaska.</i>					
Lock and Dam 1,000 feet long, at Ile à Cardin, about 2 miles below Yamaska Village.....	1	162½	31	7	1½
<i>Rivière du Lièvre.</i>					
Lock and Dam 288 feet long.....	1	162½	32½	8	1½
<i>Trent River Navigation.</i>					
Canals and Locks detached—Bay of Quinté to Balsam Lake, <i>via</i> Bobcaygeon, Fenelon Falls and Cameron's Lake, 165 miles. Bay of Quinté to Port Perry, Lake Scugog, <i>via</i> Bobcaygeon and Sturgeon Lake, 190 miles.	13	134	33	5 to 5½	190
<i>St. Peter's Canal, Bras-d'Or Lake, Nova Scotia.</i>					
St. Peter's Canal (Cape Breton).....	1	200	48	Lowest water 18	Feet 2,400

**EXPENDITURE on Construction and enlargement of the Canals of Canada,
1821 to 1889.**

NAMES.	Expenditure prior to 1st July, 1867.	Expenditure from 1st July, 1867 to 30th June, 1889.	Total Expenditure to 30th June, 1889.
	\$ cts.	\$ cts.	\$ cts.
Beauharnois	1,611,424 11	124,290 47	1,735,714 58
Carillon and Grenville..	(a) 63,053 64	3,977,920 07	4,040,973 71
Chambly	634,711 76	276,061 97	910,773 73
St. Ours Lock	121,537 65	45,174 58	166,712 23
Cornwall	1,933,152 69	1,056,135 84	2,989,288 53
Culbute		413,717 48	413,717 48
Lachine	(b) 2,587,532 85	6,633,681 87	9,221,214 72
Murray		1,043,046 41	1,043,046 41
Rideau	(c) 4,064,764 07	121,097 76	4,185,861 83
Saut-Ste-Marie		42,164 01	42,164 01
St. Ann's	134,456 51	1,039,514 24	1,173,970 75
St. Peter's	156,523 32	520,743 95	677,267 27
Tay		407,764 72	407,764 72
Trent	309,371 31	751,238 48	1,060,609 79
Burlington Bay	432,684 40	56,839 20	489,523 60
Welland	(d) 7,638,239 83	16,149,710 47	23,787,950 30
Williamsburgh	1,320,655 54	504,098 68	1,824,754 22
St. Lawrence Canals not apportioned	116,821 31		116,821 31
do surveys		161,719 89	161,719 89
do chain vessels and improve- ment of navigation		591,475 76	591,475 76
Bas de Verte Canal surveys		44,387 53	44,387 53
Total Expenditure	21,124,928 99	33,960,783 38	55,085,712 37

(a) Expenditure by Imperial Government on these canals not ascertained, records relating to same having been destroyed by fire in the Ordnance Office, Montreal, in 1852.

	<i>Imperial Government.</i>	<i>Provincial Government.</i>
(b) \$	40,000 00	\$ 2,547,532 85
(c)	3,911,701 47	153,062 60
(d)	222,220 00	7,416,019 83
Other canals as above		6,834,392 24
	<u>\$ 4,173,921 47</u>	<u>\$16,951,007 52</u>

N.R.—Expenditures on Repairs are not included above.

The above statement was prepared by O. Dionne, Accountant of the Department of Public Works.

VESSELS AND TONNAGE.

REGISTERED TONNAGE of the Principal Countries in the World, 1888.

Countries.	Vessels.	Tonnage.	Average Tons to each Vessel.
United Kingdom.....	17,723	7,123,754	402
Sweden and Norway.....	11,380	2,024,471	178
German Empire.....	3,811	1,240,182	325
Canada.....	7,142	1,089,642	152
*United States.....	1,621	1,015,562	626
France.....	15,237	972,525	64
Italy.....	6,918	895,625	129
Russia.....	2,387	614,561	257
Spain.....	968	531,269	548
Australasia.....	2,786	361,634	129
Netherlands.....	621	673,781	1,085
Austria.....	9,728	287,267	30
Denmark.....	3,324	272,500	82
Greece.....	5,157	258,846	50
Turkey.....	842	182,259	216
Portugal.....	220	79,516	361
Belgium.....	65	86,391	1,329

Licensed and enrolled vessels are not included in the preceding.

* If the licensed and enrolled vessels belonging to the United States, which are employed in the river and home trade, were included, that country would take second place, its total tonnage amounting to 4,307,475 tons.

COMPARATIVE Statement of all Vessels (both sea-going and inland) arrived and departed from Canadian Ports (exclusive of Coasting Vessels) in 1888 and 1889.

NATIONALITIES.	Number of Vessels.	Tons Register.	FREIGHT.		Number of Men.
			Tons. Weight.	Tons Meas- urement.	
1888.					
British.....	3,316	3,326,417	1,341,407	581,945	96,033
Canadian.....	33,395	6,182,697	2,296,748	1,440,009	266,258
Foreign.....	27,592	5,708,194	1,181,602	1,441,217	278,620
Total.....	64,303	15,217,308	4,819,757	3,463,171	640,911
1889.					
British.....	3,305	3,333,079	1,304,650	586,196	105,069
Canadian.....	34,564	6,636,032	2,147,859	1,476,032	303,337
Foreign.....	27,188	6,085,110	1,596,950	1,233,337	281,680
Total.....	65,057	16,054,221	5,049,459	3,295,565	690,086

The above taken from the "Statistical Year Book of Canada," for 1889, published in 1890.

RAILWAYS
OF
CANADA, BRITISH EMPIRE
AND
FOREIGN COUNTRIES.
NAMES AND LENGTH.

List of Canadian Railways, 30th June, 1889.

(From the Railway Statistics of Canada, 1889.)

Name of Railway.	Completed.	Under Construction.
	Miles.	Miles.
Albert.....	50.75	
Albert Southern.....	10.50	6.50
Baie des Chaleurs.....	60.00	40.00
Baie de Quinté and Navigation Co.....	3.50	
Brantford, Waterloo and Lake Erie.....		5.00
Brockville, Westport and Saut-Ste-Marie.....	45.00	
Buctouche and Moncton.....	32.00	
Canada Atlantic.....	138.40	
Canada Southern.....	378.91	
Canadian Government Railways:—		
Cape Breton.....	98.75	
Eastern Extension.....	80.00	
Intercolonial.....	894.00	
Oxford and New Glasgow.....	72.35	
Prince Edward Island.....	210.60	
Canadian Pacific.....	\$,415.30	
Atlantic and North-West.....	336.10	
Manitoba South-West Colonization.....	211.20	
North Shore.....	206.10	
St. Lawrence and Ottawa.....	56.50	
Toronto, Grey and Bruce.....	188.70	4,973.40
Credit Valley.....	175.20	
Ontario and Quebec.....	339.00	
West Ontario Pacific.....	26.60	
Guelph Junction.....	15.50	
Toronto Junction to Strachan Avenue.....	3.20	
Caraguet.....	68.00	
Carillon and Grenville.....	13.00	
Central Ontario.....	104.00	
Central of New Brunswick.....	68.00	6.66
Chatham Branch.....	11.00	
Cornwallis Valley.....		14.00
Cumberland Railway and Coal Co.....	32.00	14.00
Dominion Line Co.....	4.80	
Drummond County.....	14.50	
Elgin, Petibodiac and Havelock.....	27.75	
Erie and Huron.....	73.12	
Esquimalt and Nanaimo.....	78.00	
Fredericton and St. Mary's Railway Bridge Co.....	1.33	
Grand Trunk.....	879.59	
Buffalo and Huron.....	162.00	
Grand Trunk, Georgian Bay and Lake Erie.....	172.75	
South Norfolk.....	17.00	
Montreal and Champlain Junction.....	81.25	
Great Western.....	537.72	
London and Port Stanley.....	23.84	
Wellington, Grey and Bruce.....	168.09	
London, Huron and Bruce.....	68.89	
Brantford, Norfolk and Port Burwell.....	34.73	
Midland.....	165.75	3,114.00
Toronto and Nipissing.....	111.50	
Grand Junction.....	85.40	
Whitby, Port Perry and Lindsay.....	46.50	
Victoria, Lindsay and Haliburton.....	53.25	
Northern.....	205.37	
Northern and Pacific Junction.....	111.37	
Hamilton and North-Western.....	173.90	
Madoc Junction and Bridgewater.....	8.60	
Jacques-Cartier Union.....	6.50	
Great Eastern.....	6.50	60.00
Great Northern.....	7.84	
Great North-West Central.....		50.00
Hereford.....	35.35	13.00
Iroindale, Bancroft and Ottawa.....	10.00	40.00
Joggins.....	13.00	

LIST of Canadian Railways, 30th June, 1889—*Continued.*

Name of Railway.	Completed.	Under Construction.
	Miles.	Miles.
Kent Northern.....	27 00	
Kingston and Pembroke.....	112 75	
L'Assomption.....	3 00	
Lake Erie, Essex and Detroit.....	38 00	
Lake Temiscaming Colonization and Railway Co.....	15 20	
Lower Laurentian.....	22 00	
Manitoba and North-Western.....	217 24 }	
Saskatchewan and Western.....	15 47 }	232 71
Massawippi Valley.....		34 00
Montreal and Western.....		30 00
Montreal and Sorel.....	44 67	
Montreal and Lake Maskinonge (return of 1888).....	10 00	
Montreal and Vermont Junction.....	23 60	
Napanee, Tamworth and Quebec.....	28 50	27 00
New Brunswick.....	174 00 }	
New Brunswick and Canada.....	127 00 }	
St. John and Maine.....	92 00 }	415 50
Fredericton.....	22 50 }	
New Brunswick and Prince Edward Island.....	36 00	
Northern and Western, of New Brunswick.....	116 00	
Northern Pacific and Manitoba.....	112 00	
North-West Coal and Navigation Co.....	109 50	
Nova Scotia Central.....	34 00	40 00
Norabouling and Nipissing.....	5 50	
Ottawa and Gatineau Valley.....		3 00
Pontiac and Renfrew.....	4 25	
Pontiac Pacific Junction.....	71 00	15 00
Qu'Appelle, Long Lake and Saskatchewan.....	22 00	
Quebec and Lake St. John.....	191 00	
Quebec Central.....	154 00	
Quebec, Montmorency and Charlevoix.....	20 50	
Stanstead, Shefford and Chambly.....	43 00	
Shore Line, late Grand Southern (return of 1888).....	82 50	
South Eastern, Montreal, Portland and Boston; Lake Champlain and St. Lawrence Junction.....	260 00	
St. Catharines and Niagara Central.....	12 35	
St. John Bridge and Railway Extension.....	1 75	
St. John Valley and Rivière du Loup.....		3 00
St. Louis, Richibucto and Buctouche (return of 1888).....	7 00	
Stewiacke Valley and Lansdowne.....		12 00
Temiscouata.....	81 00	
Thousand Islands.....	4 08	
Western Counties.....	67 00	20 00
Windsor and Annapolis.....	84 00 }	
Windsor Branch.....	32 00 }	116 00
Winnipeg and Hudson's Bay.....	40 00	
Wood Mountain and Qu'Appelle (return of 1888).....		17 00
Total.....	13,324 71	416 16

RAILWAYS in British Possessions, 1888.

Countries.	Miles of Railway.	Number of Persons to each Mile.	Square Miles of Area to each Mile.
United Kingdom.....	19,578	1,924	6
India.....	14,383	14,589	114
Canada.....	12,701	391	273
Australasia.....	9,638	368	319
New South Wales.....	2,636	512	132
New Zealand.....	1,841	328	56
Cape of Good Hope.....	1,776	775	120
Victoria.....	2,018	513	43
Queensland.....	1,765	208	378
South Australia.....	1,419	224	636
Tasmania.....	318	448	83
Natal.....	220	2,168	85
Ceylon.....	181	15,746	140
Western Australia.....	241	173	4,049
Jamaica.....	93	6,489	45
Mauritius.....	92	4,002	8
Newfoundland.....	84	2,349	590
Trinidad.....	54	3,398	32
Barbadoes.....	24	7,230	7
British Guiana.....	23	12,045	4,739
Malta.....	8	20,084	15

RAILWAYS in Principal Foreign Countries, 1887-88.

Countries.	Miles of Railway.	Number of Persons to each Mile.	Square Miles of Area to each Mile.
Belgium.....	1,111	2,613	16
Denmark.....	1,111	2,129	4
France.....	1,111	1,736	12
Germany.....	1,111	1,587	7
Italy.....	1,111	1,465	8
Netherlands.....	1,111	5,260	66
Spain.....	1,111	4,000	15
Sweden.....	1,111	2,712	8
Switzerland.....	1,111	3,950	28
Austria.....	1,111	3,334	34
Prussia.....	1,111	4,692	111
Russia.....	1,111	3,697	55
United States.....	1,111	2,910	23
Sweden and Norway.....	1,111	1,297	33
Portugal.....	1,111	1,581	9
Spain.....	1,111	10,262	130
Italy.....	1,111	32,914	206
France.....	1,111	6,147	10
Germany.....	1,111	731	230
Sweden.....	1,111	2,453	606
Spain.....	1,111	1,550	180
Italy.....	1,111	1,111	138
Sweden.....	1,111	1,661	26
Spain.....	1,111	1,399	24
Italy.....	1,111	1,744	212

DATES of Openings of Railways in Various Countries since 1825.

Countries.	Year.	Date.
England.....	1825	17th September.
Austria.....	1828	30th do
France.....	1828	1st October.
United States.....	1829	28th December.
Belgium.....	1835	3rd May.
Germany.....	1835	7th December.
Canada.....	1836	21st July.
Cuba.....	1837	
Russia.....	1838	4th April.
Italy.....	1839	— September.
Switzerland.....	1844	15th July.
Jamaica.....	1845	21st November.
Spain.....	1848	24th October.
Mexico and Peru.....	1850	
Sweden.....	1851	
Chili.....	1852	— January.
India.....	1853	18th April.
Norway.....	1853	— July.
Portugal.....	1854	
Brazil.....	1854	21st April.
Victoria (Australia).....	1854	14th September.
Columbia.....	1855	20th January.
New South Wales.....	1855	25th September.
Egypt.....	1856	— January.
Natal.....	1860	26th June.
Turkey.....	1860	4th October.
Mauritius.....	1862	13th May.
Algeria.....	1862	15th August.
Western Australia.....	1864	21st January.
British Guiana.....	1864	1st September.
Argentine Republic.....	1864	14th December.
Queensland.....	1865	31st July.
Ceylon.....	1865	1st October.
Uruguay.....	1869	1st January.
Tasmania.....	1871	19th February.
Honduras.....	1871	25th September.
Japan.....	1873	17th October.
Trinidad.....	1880	
Barbados.....	1883	10th September.

The railways owned by the Dominion Government are the Intercolonial, Windsor Branch, Eastern Extension and Prince Edward Island Railways, with a total mileage in operation of 1,217 miles, as follows :

	Miles.
Intercolonial Railway	894
Eastern Extension Railway.....	80
Windsor Branch	32
Prince Edward Island Railway	211
	<u>1,217</u>

R

Mines, for the Year ended

31st June 1899

	Length of Line Miles	Engines	No. of Waggon Cars	Remarks.
United Kingdom.				
India.....				
Canada.....				
Australasia.....				
New South Wales.....	8 00	4 8½	4	118
New Zealand.....	6 00	4 8½	3	24
Cape of Good Hope.....	11 00	4 8½	3	27
Victoria.....	3 00	3 0	2	180
Queensland.....	5 00	4 8½	3	
South Australia.....				
Tasmania.....	31 00		14	349
Natal.....				
Ceylon.....				
Western Australia.....	75	4 8½	.....	Engines and cars furnished by International Coal and Railway Co.
Jamaica.....				
Mauritius.....	4 80	4 8½	3	208
Newfoundland.....	5 00	4 8½	2	117
Trinidad.....	43 00	3 0	3	224
Barbados.....	1 50	3 6	2	123
British Guiana.....	12 00	4 8½	3	176
Malta.....	2 25	4 8½	2	120
	89 30		15	968

TELEGRAPH LAND LINES

AND

SUBMARINE CABLES.

No. 9.—LINES of Railway owned by Coal and Iron Mines, for the Year ended 30th June, 1889.

Name.	Length of Rail- way.	Gauge.	No. of Engines.	No. of Waggon- s.	Remarks.
NOVA SCOTIA.					
	Miles.	Ft. In.			
Intercolonial Coal Mining Co.	8 00	4 8½	4	118	Cars furnished by Intercolonial Ry.
Acadia Coal Co.	6 00	4 8½	2	24	
Londonderry Iron Co.	11 00	4 8½	3	27	
do do	3 00	3 0	2	180	
Albion	3 00	4 8½	3		
	31 00		14	349	
CAPE BRETON.					
Old Bridgeport	75	4 8½			Engines and cars furnished by Inter- national Coal and Railway Co.
General Mining Association—					
Sydney	4 80	4 8½	3	208	
Victoria	5 00	4 8½	2	117	
Sydney and Louisburg	43 00	3 0	3	224	
Gowrie	1 50	3 6	2	123	
International	12 00	4 8½	3	176	
Caledonia	2 25	4 8½	2	120	
	69 30		15	968	

TELEGRAPH LAND LINES

AND

SUBMARINE CABLES.

GOVERNMENT Telegraph Lines 1890.

LAND LINES.

Location.	Terminal Stations.	Distances in Statute Miles.
Anticosti Island, Que.	From Fox Bay to English Bay	214
British Columbia.	Ashcroft to Barkerville.	276½
Cape Breton, N.S.	Sydney to Meat Cove	128½
Cape Sable, N.S.	Barrington to Cape Sable Light House.	16
Chatham-Escuminac, N.B.		42
Campo-Bello Island, N.B.	From Welchpool to cable landings	8
Chicoutimi, Que.	Bay St. Paul to Chicoutimi.	92
Gaspé, Que.	Gaspé Basin to cable landing	28
Grand Manan Island, N.B.	Southern Head to do	21
Grosse Isle Quarantine	Quebec to Grosse Isle <i>via</i> Orleans	46
Low Point, C.B., N.S.	Low Point to Lingan	5
Magdalen Islands, Que.	Old Harry to Amherst.	83½
Mabou-Cheticamp, C.B., N.S.		63
Newfoundland.	From Port au Basque to Cape Ray	14
North Shore St. Lawrence, Que.	Murray Bay to Point Esquimaux	496
Pelee Island, Ont.	South Dock to cable landing	23
Qu'Appelle-Edmonton, N. W. T.	Including Branch Lines	676½
Wood Mountain, N.W.T.	From Wood Mountain to Moose Jaw.	90½
	Total.....	2,323½

CABLES.

		Nautical Miles.
Anticosti Island, Que.	Gaspé to South-West Point	44½
Big Bras-d'Or, C.B., N.S.	Across the Channel.	5
Campo-Bello Island, N.B.	Eastport to Campo-Bello.	16
Cape Sable, N.S.	Across the Channel	19
Grand Manan, N.B.	Campo-Bello to Grand Manan	74
Godbout, North Shore, Que.	Manicouagan to Godbout	26
Grosse Isle, Que.	Grosse Isle to Isle aux Reaux	2
Magdalen Islands, Que.	Meat Cove to Old Harry and Bird Rock	73½
Pelee Island, Ont.	Point Pelee to Pelee Island.	8½
Pointe aux Outardes	Bersimis to Pointe aux Outardes	12
St. Pierre, Que.	L'Ange Gardien to St. Pierre, Orleans Island.	9
St. François, Que.	St. François to Isle au Reaux.	2
Tadoussac, North Shore, Que.	Across the Saguenay River	14
	Total.....	181½

PROPOSED Cable to Australia.

	Nautical Miles.
From Sook Bay, B.C., to Sandwich Islands	2,350
Sandwich Islands to Fanning Island	1,050
Fanning Island to Samoa Island	1,260
Samoa Island to Fiji Islands	475
Fiji Islands to Brisbane, Australia	1,620
Total.....	6,755

PROPOSED DIRECT CABLE TO SCOTLAND.

	Nautical Miles.
Anticosti to Greenly Island, Strait of Belle-Ile	240
Greenly Island to Mull, Scotland.	1,900
(Or to Westport Island, Clew Bay, Ireland.)	
Total length.....	2,140

PROPOSED Cable to Japan *via* Aleutian Islands.

Vancouver Island, B.C., to Yezo, Japan, probable length.....	3,450 Nautical Miles.
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APPROXIMATE Distances and Historical Dates of some of the Principal Main Submarine Cable Routes in operation, 1888.

From	To	Knots or Nautical Miles.
Dover	Calais. (The 1st submarine cable laid, Europe, 1851).	25
Prince Edward Island	New Brunswick. (The 1st cable laid, N. America, 1852).	10
Newfoundland	Cape Breton, N.S. (The 2nd cable laid, N. America, 1856).	85
Ireland	Newfoundland. (The first transatlantic cable, 1858).	2,200
do	do (5 subsequent cables, 1865-66, 73-74-80, each averaging	1,870
Newfoundland, Placentia Bay	Sydney, C.B.	280
do do	do <i>via</i> St. Pierre	300
France	St. Pierre Miquelon	2,584
St. Pierre	Massachusetts, United States	749
England	Nova Scotia (direct)	2,540
Nova Scotia	Massachusetts, United States	500
England	Portugal, Lisbon	823
Portugal	Madeira	613
Madeira	Cape de Verdes Islands	1,197
Cape de Verdes	Pernambuco, South America	1,844
Para, South America (11 loops)	Buenos Ayres	3,782
Texas, United States	Vera Cruz, Mexico	738
Salina Cruz, Mexico (7 loops)	Callao and Lima, Peru	3,040
Lima (7 loops)	Valparaiso, Chili	1,703
Florida, U.S.	Cuba	125
Cuba (12 loops)	Jamaica, W. I. Islands and Demarara	2,200
Jamaica	Isthmus Panama	590
England (2 loops)	Gibraltar	1,154
Gibraltar	Malta	1,120
Malta	Alexandria, Egypt	924
Suez, Egypt	Aden, Arabia	1,460
Aden	Bombay, Hindostan	1,818
Madras, Hindostan	Singapore	1,808
Singapore (2 loops)	Hong Kong, China	1,595
Total cable distance, G. Britain to China, <i>via</i> India		9,879
England (7 loops)	Singapore	8,284
Singapore	Java	919
Java	Port Darwin, Australia	1,131
Total cable distance, G. Britain to Australia, <i>via</i> India		10,334
England (6 loops)	Aden, Arabia	4,658
Aden	Zanzibar, Africa	1,908
Zanzibar	Mozambique	625
Mozambique	Dalga Bay	966
Dalga Bay	Natal	345
Total cable distance, G. Britain to Cape of Good Hope		8,502
Hong Kong	Japan (2 loops) <i>via</i> Shanghai, China	1,668

†† About 115,000 knots of submarine cables have been submerged to date of 1888.

N.B.—An examination of the spheres with the foregoing table of distances, demonstrates that the shortest cable route between Great Britain and China is *via* the Dominion of Canada and the Pacific Ocean.

Up to 1890, 120,559.8 nautical miles of submarine cables have been submerged, viz.:—
12,741.9 by Governments, and 107,817.9 by private companies.

The preceding was furnished by F. N. Gisborne, Superintendent of Government Telegraph Lines.

For details respecting the *Submarine Cables of the World*,— See the following pages:—

THE SUBMARINE CABLES OF THE WORLD.

Extracted from the Official Document issued by The International Bureau of Telegraphic Administrations, Berne

(WITH ADDITIONS).

SUMMARY OF CABLES OWNED BY GOVERNMENT ADMINISTRATIONS.

COUNTRY.	No. of Cables.	Length in Nautical Miles.	
		Of Cables.	Of Conductors.
Austria.....	31	97 700	106 190
Brazil.....	19	19 288	36 019
Belgium.....	2	54 250	278 500
Canada (<i>see List of Cables, p. 49</i>).....	21	220 500	220 500
Cochin China.....	2	795 000	795 000
Denmark.....	47	192 372	568 998
Dutch Indies.....	1	31 310	31 310
France.....	51	3,269 143	3,697 143
Germany.....	43	1,579 328	2,876 627
Gt. Britain and Ireland (<i>see List of Cables, pp. 46 to 49</i>).....	103	1,488 818	5,071 941
Greece.....	46	459 710	459 710
Holland.....	20	59 020	79 970
India, Indo-European Telegraph Department (Government Administration (<i>see List of Cables, pp. 48 and 49</i>)).....	89	1,911 650	1,911 650
Italy.....	38	1,027 100	1,091 300
Japan.....	11	55 498	103 368
New Caledonia.....	1	1 000	1 000
New Zealand.....	3	196 315	284 945
Norway.....	236	30 620	230 620
Queensland.....	13	162 350	165 050
Russia in Asia.....	1	70 017	70 017
Russia in Europe, and the Caucasus.....	8	212 680	236 240
Senegal.....	1	3 000	3 000
South Australia.....	5	49 900	49 900
Spain.....	3	135 530	135 530
Sweden.....	11	88 170	149 280
Turkey in Europe and Asia.....	10	331 660	334 660
	816	12,741 929	18,988 468

SUMMARY OF CABLES OWNED BY PRIVATE COMPANIES.

See List of Cables given on Pages 51 to 58.	No. of Cables.	Length of Cables in Nautical Miles.	Capital.
			£
I. Compagnie für Legung und Unterhaltung des Deutsch Norwegischen Kabels	3	248.04	73,640
II. Direct Spanish Telegraph Company	4	707.73	143,724
III. Spanish National Submarine Telegraph	7	1,294.650	335,090
IV. West African Telegraph Company	12	3,015.42	531,090
V. Black Sea Telegraph Company	1	346	130,000
VI. Great Northern Telegraph Company	22	6,110	1,825,000
VII. Eastern Telegraph Company	70	21,859.536	5,722,450
VIII. Eastern and South African Telegraph Company	9	6,571	818,300
IX. Eastern Extension, Australasia, and China Telegraph Company	22	12,958	3,329,400
X. Anglo-American Telegraph Company	13	10,196.45	7,000,000
XI. Direct United States Cable Company	2	3,101.33	1,214,200
XII. Compagnie Française du Télégraphe de Paris à New- York	4	3,400.34	1,680,000
XIII. American Telegraph and Cable Company	4	5,537	2,800,000
XIV. Commercial Cable Company	6	6,937.61	2,000,000
XV. Brazilian Submarine Telegraph Company	6	7,864	1,474,000
XVI. African Direct Telegraph Company	7	2,743	475,000
XVII. Cuba Submarine Telegraph Company	3	940	220,000
XVIII. West India and Panama Telegraph Company	20	4,119	1,325,530
XIX. Société Française des Télégraphes Sous-marins	5	980	220,000
XX. Western and Brazilian Telegraph Company*	9	3,762	2,404,490
XXI. River Plate Telegraph Company	1	32	55,500
XXII. Mexican Telegraph Company	2	700	200,000
XXIII. Central and South American Telegraph Company	9	3,178.11	1,000,000
XXIV. West Coast of America Telegraph Company	7	1,638.72	450,000
Total	248	107,817.945	35,427,414

*Including London Platino-Brazilian and Montevidean and Brazilian Companies.

GENERAL SUMMARY.

	No. of Cables.	Length in Nautical Miles.	
		Of Cables.	Of Con- ductors.
Government administrations	816	12,741.929	18,987.568
Private companies	247 1	107,817.945	108,589.905
	1,064	120,559.874	127,577.473

I.—CABLES owned by British Government Administrations.

LANDING PLACES.	Date of Laying.	No. of Conductors in each Section.	LENGTH IN NAUTICAL MILES.	
			Of Cables.	Of Conductors.
GREAT BRITAIN AND IRELAND.				
NORTH SEA CABLES.				
Lowestoft to Zandvoort (Holland).....	1858	4	110·481	441·924
Benacre, near Kessingland, to Zandvoort (Holland).....	1884	4	108·295	433·180
A.—IRISH SEA AND ST. GEORGE'S CHANNEL.				
Port Mora (Scotland) to Whitehead (Ireland).....	1888	4	25·356	101·424
Port Kail (Scotland) to Donaghadee (Ireland).....	1870	4	22·940	91·760
Knock Bay (Scotland) to Whitehead (Ireland).....	1879	4	22·884	91·536
St. Bees, near Whitehaven, to Port Cornah (Isle of Man).....	1885	3	31·119	93·357
Carnarvon Bay to Howth, near Dublin.....	1871	7	64·444	451·108
Abernawr, near Haverfordwest, to Blackwater, near Wexford (Ireland).....	1880	4	55·530	222·120
Fishguard Bay (South Wales) to Blackwater, near Wexford (Ireland).....	1883	4	61·845	247·380
Abergereirch, near Port Nevin (North Wales), to Newcastle, County Wicklow (Ireland).....	1886	4	54·860	219·440
B.—CHANNEL AND CHANNEL ISLANDS.				
Compass Cove, near Dartmouth, to Fort Doyle (Guernsey)....	1884	3	67·236	201·708
Alderney to Fort Doyle (Guernsey).....	1870	1	18·563	18·563
St. Martin's Point (Guernsey) to Grève au Lancon (Jersey)...	1884	3	16·260	48·780
Hurst Castle to Sconce Point (Isle of Wight).....	1886	7	1·230	8·610
Hurst Castle to Yarmouth (Isle of Wight).....	1885	3	2·327	6·981
Portcurno to St. Mary's (Scilly Isles).....	1886	1	27·534	27·534
St. Mary's (Scilly) to Isle of Tresco (Scilly).....	1886	1	1·104	1·104
C.—ORKNEY AND SHETLAND ISLES.				
Sinclair Bay, Wick, to Sandwick Bay (Shetland).....	1885	1	122·120	122·120
Dunnet, near Thurso, to Rackwick Bay, Hoy Island (Orkney)	1876	1	20·565	20·565
Hoy (Orkney) to Houton Head (Mainland).....	1873	1	2·360	2·360
Hoy (Orkney) to Houton Head (Mainland).....	1876	1	2·360	2·360
Workhead (Mainland) to Isle of Shapinsay (Orkney).....	1884	1	1·930	1·930
Rerwick Head (Mainland) to Stronsa (Orkney).....	1885	1	9·848	9·848
Stronsa to Sanda (Orkney).....	1884	1	3·0	3·0
Scatha Bay (Orkney) to Sandwick Bay (Shetland).....	1881	1	65·883	65·883
Moss Bank (Shetland) to Yell (Shetland Isles).....	1882	1	2·580	2·580
Mainland, Shetland, to Yell Island.....	1887	1	2·735	2·735
Yell to Uist (Shetland).....	1887	1	1·223	1·223
Burra (Orkney) to South Ronaldsha (Orkney).....	1887	1	1·644	1·644
Burra (Orkney) to Howe quay Head (Orkney).....	1884	1	2·710	2·710
D.—HEBRIDES AND WESTERN COASTS OF SCOTLAND AND IRELAND.				
Loch Ewe (Scotland) to Branahue Bay, near Stornoway (Island of Lewis, Hebrides).....	1872	1	32·553	32·553
Harris (Lewis) to North Uist (Hebrides).....	1886	1	11·468	11·468
South Uist to Castle Bay, Barra (Hebrides).....	1884	1	16·510	16·510
Port na Cross, Fairlie, to Corrie (Arran).....	1885	4	9·562	38·248
Ross-shire to Isle of Skye.....	1872	1	0·778	0·778
Govan Bay, near Oban, to the Isle of Mull.....	1871	1	6·400	6·400
Carried forward.....		83	1,008·267	3,051·454

LANDING PLACES.	Date of Laying.	No. of Conductors in each Section.	LENGTH IN NAUTICAL MILES.	
			Of Cables.	Of Conductors.
Brought forward.....		83	1,008·267	3,051·454
Glenacardock Point, Cantyre, to the Isle of Islay.....	1871	1	16·140	16·140
Port Cranaig, Cantyre, to Arran.....	1885	3	3·264	9·792
Largs to Great Cumbræ.....	1887	1	1·403	1·403
Ardine Point to Ardsberg Point, Bute.....	1881	4	1·358	5·432
Mull to Coll.....	1888	1	9·304	9·304
Tiree to Coll.....	1888	1	2·175	2·175
Rugha Ben (Scotland) to Isle of Bute.....	1872	1	0·443	0·443
Renard Point (Ireland) to Valentia.....	1870	4	0·444	1·776
E.—EASTERN COAST OF SCOTLAND.				
Burghhead to Helmsdale.....	1885	3	26·147	78·441
F.—BAYS AND ESTUARIES.				
Across the River Dart to Chain Ferry.....	1884	3	0·295	0·885
Across the River Dart to Chain Ferry.....	1888	4	0·281	1·124
Across the Port of Milford.....	1871	4	0·591	2·364
Across the Tees at Middlesbrough.....		7	0·160	1·120
Across the Tees at Middlesbrough.....		7	0·160	1·120
Across the Tees at Middlesbrough.....		4	0·160	0·640
Across the Tees at Middlesbrough.....		4	0·160	0·640
Across the Tees at Middlesbrough.....		4	0·160	0·640
Across the Tees at Middlesbrough.....		4	0·160	0·640
Across the Tees at Middlesbrough.....		4	0·160	0·640
Across the Tees at Middlesbrough.....		4	0·160	0·640
Across the Gloucester and Sharpness Canal at Sharpness.....		4	0·049	0·196
Across the Gloucester and Sharpness Canal at Sharpness.....		4	0·049	0·196
Across the Gloucester and Sharpness Canal at Sharpness.....		4	0·049	0·196
Across the Gloucester and Sharpness Canal at Sharpness.....		4	0·049	0·196
Across the Canal from Swansea Docks to Swansea.....		4	0·074	0·296
Across the River Yar (Isle of Wight).....		7	0·074	0·518
Across the River Medina, Isle of Wight.....		4	0·078	0·312
Across the River Dee at Queensferry, near Chester.....		4	0·103	0·412
Across the River Dee at Queensferry, near Chester.....		4	0·103	0·412
Across Firth of Forth to Alloa.....	1886	1	0·275	0·275
Across Loch Etive at Connel Ferry.....	1882	1	0·276	1·276
Across Loch Etive at Connel Ferry.....	1884	4	0·280	0·120
Across Loch Eil at Corran Ferry.....	1885	1	1·120	1·120
Across Loch Creran at Shian Ferry.....	1882	1	0·611	0·611
Across Loch Creran at Shian Ferry.....	1882	1	0·631	0·631
Across Loch Creran at Shian Ferry.....	1888	4	0·658	2·632
Across Loch Leven at Ballachulich Ferry.....		1	0·196	0·196
Across Loch Leven at Ballachulich Ferry.....		1	0·196	0·196
Across Loch Leven at Ballachulich Ferry.....	1882	1	0·177	0·177
Across Loch Leven at Ballachulich Ferry.....	1882	1	0·196	0·196
Across Port of Waterford (Waterford Harbour, Ireland).....	1871	4	1·353	5·412
Across Port of Waterford (Waterford Harbour, Ireland).....	1871	4	1·420	5·680
Across Port of Waterford (Waterford Harbour, Ireland).....	1871	4	1·510	6·040
Across River Suir at Waterford Bridge (Ireland).....		4	0·147	0·588
Across River Suir at Waterford Bridge (Ireland).....		4	0·147	0·588
Across River Suir at Waterford Bridge (Ireland).....		4	0·147	0·588
Across River Suir at Waterford Bridge.....		4	0·147	0·588
Across River Suir at Waterford Bridge.....		4	0·147	0·588
Across River Slaney at Wexford (Ireland).....	1880	7	0·340	2·380
Across River Slaney at Wexford (Ireland).....	1883	4	0·343	1·372
New Holland to Dairycoates, near Hull.....	1870	7	1·396	9·772
Devonport to Torpoint.....		1	0·377	0·377
Devonport to Torpoint.....		1	0·359	0·359
Granton (Firth of Forth) to Burntisland.....	1871	4	5·071	20·284
Granton (Firth of Forth) to Aberdeen.....	1882	7	4·510	31·570
Cove to Blairmore, Loch Long.....	1885	7	1·550	10·850
Cove to Blairmore, Loch Long.....	1885	7	1·558	10·866
Carried forward.....		284	1,097·248	3,305·009

LANDING PLACES.	Date of Laying.	No. of Conductors in each Section.	LENGTH IN NAUTICAL MILES.	
			Of Cables.	Of Conductors.
Brought forward.....		284	1,067.248	3,305.000
North Queensferry to South Queensferry.....	1873	7	1.220	8.540
North Queensferry to South Queensferry.....	1884	7	1.400	9.800
North Queensferry to South Queensferry.....	1886	7	1.322	9.254
Strachur, Loch Fyne to Kenmure.....	1870	6	1.115	6.600
Strachur, Loch Fyne to Kenmure.....	1882	7	1.054	7.378
Row to Clachan Gairloch.....	1878	7	0.422	2.954
Row to Clachan Gairloch.....	1882	4	0.309	1.396
Row to Clachan Gairloch.....	1887	3	0.434	1.302
Whitepoint to Haulbowline (Ireland).....	1	1	0.259	0.259
Whitepoint to Haulbowline (Ireland).....	1	1	0.259	0.259
Haulbowline to Spike Island (Ireland).....	1	1	0.384	0.384
Cross Haven to West Seamount (Ireland).....	1	1	0.185	0.185
Foyle Road to Waterside, Londonderry.....	7	7	0.246	1.722
Foyle Road to Waterside, Londonderry.....	4	4	0.246	0.984
Total.....		347	1,106.193	3,336.316
INTERNATIONAL SYSTEM.				
ANGLO-FRENCH CABLES.				
Calais to Dover.....	1851	4	21.750	87.000
Boulogne to Dover.....	1859	6	20.250	121.500
Dieppe to Beachy Head.....	1861	6	62.000	372.000
Havre to Beachy Head.....	1870	6	69.500	417.000
Pirou, near Coutance, to Flicquet Bay (Jersey).....	1860	1	16.750	16.750
ANGLO-BELGIAN CABLES.				
Middelkerke, near Ostend, to Ramsgate.....	1853	6	61.500	369.000
Panne, near Furnes, to Dover.....	1896	4	47.000	188.000
ANGLO-GERMAN CABLES.				
Norderney to Lowestoft.....	1866	4	232.250	929.000
Greetsiel, near Emden, to Lowestoft, comprising the sections:				
(Belonging to German Government)				
Greetsiel to Borkum.....	1871	4		
Borkum to Lowestoft.....				
Greetsiel, near Emden, to Valentia (Ireland).....	1882	1		
Total.....		42	531.000	2,500.250
Deduct half length of cables owned by Great Britain in common with France and Belgium.....			149.375	785.625
Actual length of cables belonging to Great Britain.....			381.625	1,714.625
Total.....			1,488.818	5,071.941
BRITISH INDIA.				
A.—INDO-EUROPEAN TELEGRAPH DEPARTMENT.				
Office: 49 and 50 Parliament Street, London.				
INTERNATIONAL SYSTEM.				
Fao (Turkey in Asia) to Bushire (Persia).....	1864	1	152.0	152.0
Bushire to Jask (Persia).....	1869	1	502.0	502.0
Bushire to Jask (Persia).....	1885	1	519.0	519.0
Jask to Gwadar (Beluchistan).....	1864	1	267.0	267.0
Gwadar to Kurrachee.....	1864	1	274.0	274.0
Total.....		5	1,714.0	1,714.0

LANDING PLACES.	Date of Laying.	No. of Conduc- tors in each Section.	LENGTH IN NAUTICAL MILES.	
			Of Cables.	Of Conductors.
B.—INDIAN ADMINISTRATION.				
<i>Headquarters : Calcutta and Simla.</i>				
INTERNAL SYSTEM.				
Across the River Myu.....	1871	1	2 44	2 44
Across the River Myu.....	1871	1	2 57	2 57
Across the River Brahmaputra to Dhubri.....	1874	1	4 60	4 60
Across the Ganges to Deegah Ghat.....	1886	1	2 60	2 60
Across the Ganges to Deegah Ghat.....	1888	1	2 0	2 0
Across the Ganges to Damukdia.....	1877	1	3 26	3 26
Across the Ganges to Damukdia.....	1881	1	3 85	3 85
Across the Ganges to Damukdia.....	1881	1	3 91	3 91
Across the Ganges to Damukdia.....	1883	1	3 46	3 46
Across the Ganges to Manihari.....	1871	1	6 11	6 11
Across the River Pudda to Goalundo.....	1879	1	6 20	6 20
Across the River Pudda to Goalundo.....	1882	1	6 30	6 30
Across the River Pudda to Kurmachar.....	1888	1	6 0	6 0
Across the River Pudda to Kurmachar.....	1888	1	6 01	6 01
Across the River Pudda to Kurmachar.....	1889	1	5 97	5 97
Across the River Pudda to Kurmachar.....	1889	1	6 0	6 0
Across the River Godavery to Rajahmundry.....	1877	1	2 60	2 60
Across the River Godavery to Rajahmundry.....	1877	1	2 60	2 60
Across the River Godavery to Rajahmundry.....	1885	1	2 60	2 60
Pagoda to Diamond Island.....	1877	1	8 58	8 58
Kilim (Bombay) to Kennerly Island.....	1886	1	2 77	2 77
Across the Straits of Palk.....	1886	1	28 36	28 36
Across the Straits of Palk.....	1885	1	29 14	29 14
Sixty-one Cables of less than two miles in length.....		61	49 72	49 72
Total.....		84	197 65	197 65

CANADIAN GOVERNMENT TELEGRAPHS.

Head Office: Montreal, Canada.

Gaspé to S.-W. Point, Anticosti Island	1880	1	44 27	44 27
Meat Cove (Cape Breton) to Old Harry (Magdalen Islands) ..	1880	1	54 90	54 90
Grosse Isle to Bird Rock (Magdalen Islands)	1880	1	18 26	18 26
Grindstone to All Right Island (Magdalen Islands)	1880	1	0 14	0 14
Big Bras-d'Or Lake, Cape Breton (Nova Scotia)	1880	1	0 50	0 50
St. Anne's Harbour, Cape Breton (Nova Scotia)	1880	1	0 50	0 50
Ingonish Harbour, Cape Breton (Nova Scotia)	1880	1	0 50	0 50
Cape Sable Island to Barrington (Nova Scotia)	1880	1	1 75	1 75
Grand Maun to Campo Bello Island (New Brunswick)	1880	1	7 23	7 23
Campo Bello to Eastport (State of Maine, U.S.)	1880	1	1 90	1 90
Saguenay River (North Shore St. Lawrence River)	1883	1	1 0	1 0
Bersimite to Manicouagan (North Shore St. Lawrence River) ..	1883	1	12 0	12 0
Point Paradis to Godbout (North Shore St. Lawrence River) ..	1883	1	26 0	26 0
Orleans Island to L'Ange Gardien (North Shore St. Lawrence River) ..	1883	1	0 75	0 75
Smouch Arm to (British Columbia)	1881	1	2 0	2 0
Vancouver Island to Gabriola Island (British Columbia) ..	1881	1	1 0	1 0
Valdes Island to Port Gray (British Columbia)	1881	1	21 30	21 30
Frazer River crossings (two cables)	1881	1	1 0	1 0
Vancouver Island to Washington Ty. (U.S.)	1884	1	17 0	17 0
Grosse Isle (Quarantine Station) to Orleans Island (North Shore St. Lawrence River)	1885	1	6 50	6 50
Mainland to Amherst Island (Lake Ontario)	1886	1	2 0	2 0
Total		21	220 50	220 50

LANDING PLACES.	Date of Laying.	No. of Conduc- tors in each Section.	LENGTH IN NAUTICAL MILES.	
			Of Cables.	Of Conductors.
SOUTH AUSTRALIA.				
Normanville to Kingscote (Kangaroo Island).....		1	38 50	38 50
Edithburg to Lighthouse (Trowbridge Island).....		1	5 0	5 0
Cape Spencer to Althorpe Lighthouse.....				
Largs Bay.....			3 20	3 20
Largs Bay.....			3 20	3 20
Total.....		2	49 90	49 90
QUEENSLAND.				
Cleveland to Peel Island.....		1	5 0	5 0
Peel Island to Dunwich.....		1	2 15	2 15
Dunwich to South Passage.....		1	12 20	12 20
Pialba to Woody Island.....		1	7 65	7 65
Woody Island to Whitecliffs.....		1	13 45	13 45
Rockhampton to Keppel Bay.....		1	77 35	77 35
Lytton to Lighthouse.....		1	5 0	5 0
Mackay to Flat-Top Island.....		1	5 0	5 0
Paterson to Thursday Island.....	1886	1	18 0	18 0
Cape Pallarenda to Magnetic Island.....	1886	1	2 75	2 75
Townsville to Magazine Island.....		7	0 45	3 15
Magazine Island to Cape Cleveland.....		1	11 10	11 10
Gatcombe Head and Facing Island.....	1886	1	2 25	2 25
Total.....		19	162 35	165 05
NEW ZEALAND.				
Wellington to Whites Bay (Cook Straits).....	1866	3	44 315	132 945
Wellington to Whites Bay (Cook Straits).....	1877	1	44 0	44 0
Wanganui to Blind Bay.....	1880	1	108 0	108 0
Total.....		5	196 315	284 945

II.—CABLES owned by Private Companies.

LANDING PLACES.	Date of Laying.	No. of Conductors in each Section.	LENGTH IN NAUTICAL MILES.	
			Of Cables.	Of Conductors.
I.—GESELLSCHAFT FÜR LEGUNG UND UNTERHALTUNG DES DEUTSCH-NORWEGISCHEN UNTERSEEISCHEN KABELS. (GERMAN-NORWEGIAN TELEGRAPH COMPANY.) <i>Head Office, 4, Werderstrasse, Berlin.</i> Hoyer (Schleswig) to Arendal (Norway), including the sections: I. Hoyer to Westerland (Silt Island)..... II. Westerland to Arendal.....				
	1879	3	248.04	744.12
II.—DIRECT SPANISH TELEGRAPH COMPANY. <i>Head Office, Winchester House, Old Broad Street, London.</i> The Lizard to Las Arenas, near Bilbao..... Barcelona to Marseilles..... Short Cables.....				
	1884	1	486.55	486.55
	1874	1	220.38	220.38
	1881	2	80	80
		4	707.73	707.73
III.—SPANISH NATIONAL SUBMARINE TELEGRAPH COMPANY. <i>Head Office, 106 Cannon Street, London, E.C.</i> Cadiz (Spain) to Santa Cruz de Tenerife..... Tejita (Teneriffe) to St. Louis de Senegal..... Santa Cruz de Tenerife to Las Palmas, Grand Canaries..... Las Palmas to Arrecife de Lanzarote..... Garachico de Tenerife to Santa Cruz de la Palmas..... Santa Cruz de Tenerife to Tejita (Teneriffe)..... Saint Louis (Senegal), to Dakar (Senegal).....				
	1884	1	864.27	864.27
	1884	1	*	*
	1883	1	67.24	67.24
	1884	1	171.95	171.95
	1883	1	69.05	69.05
	1884	1	32.149	32.149
	1885	1	90	90
		7	1,294.659	1,294.659
IV.—WEST AFRICAN TELEGRAPH COMPANY. <i>Head Office, 50 Old Broad Street, London, E.C.</i> Dakar (Senegal) to Bathurst (British possession)..... Bathurst to Bolama (Portuguese possession)..... Bolama to Bissau..... Bolama to Conakry (French possession)..... Conakry to Sierra Leone (English possession)..... Grand Bassam (French possession) to Accra (English possession)..... Accra to Kotonou (Porto Novo) (French possession)..... Kotonou to San Thome (Portuguese possession)..... San Thome to the Gaboon (Freetown) (French possession)..... San Thome to Island of Principe (Portuguese possession)..... San Thome to Loanda..... Principe to Bonny.....				
	1886	1	106.60	106.60
	1886	1	363.77	363.77
	1885	1	42	42
	1885	1	238	238
	1886	1	70.70	70.70
	1886	1	241.30	241.30
	1886	1	215	215
	1886	1	486	486
	1886	1	176.50	176.50
	1886	1	126.25	126.25
	1886	1	759.60	759.60
	1889	1	189.70	189.70
		12	3,015.42	3,015.42

*Worked by France.

LANDING PLACES.	Date of Laying.	No. of Conductors in each Section.	LENGTH IN NAUTICAL MILES.	
			Of Cables.	Of Conductors.
V.—BLACK SEA TELEGRAPH COMPANY.				
<i>Head Office, Winchester House, Old Broad Street, London, E.C.</i>				
Odessa (Russia) to Kilia, near Constantinople	1874	1	346	346
VI.—GREAT NORTHERN TELEGRAPH COMPANY.				
<i>Head Office, 28 Kongens Nytorv, Copenhagen. London Agency, 3 St. Helen's Place, Bishopsgate Street Within, E.C.</i>				
1st.—CABLES IN EUROPE.				
Peterhead (Scotland) to Ekersund (Norway)	1869	1	267	267
Newbiggin (England) to Marstrand (Sweden) comprising the sections :				
I. Newbiggin to Arendal (Norway)	1880	1	424	424
II. Arendal to Marstrand (Sweden)	1880	1	98	98
Newbiggin to Hirtshals (Denmark)	1873	1	420	420
Newbiggin to Søndervig (Denmark)	1868	1	337	337
Oye, near Calais (France), to Fano (Denmark)	1873	1	381	381
Hirtshals (Denmark) to Arendal (Norway)	1867	1	70	70
Skagen (Denmark) to Marstrand (Sweden)	1873	2	34	68
Moen (Denmark) to Island of Bornholm (Denmark)	1868	2	78	156
Bornholm (Denmark) to Libau (Russia)	1869	1	226	226
Grisslehamn (Sweden) to Nystad (Russia)	1869	1	96	96
Grisslehamn (Sweden) to Nystad (Russia)	1883	1	104	104
Grisslehamn (Sweden) to Island of Aaland (Russia)	1877	1	28	28
Aaland (Russia) to Nystad (Russia)	1876	1	57	57
2nd.—CABLES IN ASIA.				
Hongkong (China) to Amoy (China)	1871	1	311	311
Amoy (China) to Woosung, near Shanghai (China), comprising the sections :				
I. Amoy to Gutzlaff (China)	1871	1	590	590
II. Gutzlaff to Woosung	1871	1	57	57
Gutzlaff to Nagasaki (Japan)	1871	1	427	427
Woosung, near Shanghai (China), to Nagasaki (Japan), comprising the sections :				
I. Woosung to Gutzlaff	1883	3	57	171
II. Gutzlaff to Nagasaki	1883	1	416	416
Nagasaki (Japan) to Wladivostock (Russia in Asia)	1871	1	766	766
Nagasaki (Japan) to Wladivostock	1883	1	753	753
Island of Kinsiu (Yokuko) (Japan) to the Corea	1883	1	111	111
Kowloo (China) to Hong Kong	1884	2	2	2
	29		6,110	6,336
VII.—EASTERN TELEGRAPH COMPANY.				
<i>Head Office, Winchester House, Old Broad Street, London.</i>				
1st.—ANGLO-SPANISH-PORTUGUESE SYSTEM.				
Porteurno, Land's End, to Carcavellos, near Lisbon (Portugal)	1870	1	850	850
Porteurno, Land's End, to Carcavellos, near Lisbon (Portugal)	1887	1	892	892
Porteurno to Vigo (Spain)	1873	1	622	622
Vigo to Caminha (Portugal)	1876	1	38	38
Vigo to Carcavellos, near Lisbon (Portugal)	1873	1	259	259
Carcavellos to Gibraltar (No. 1)	1870	1	383	383
Carcavellos to Gibraltar (No. 2)	1887	1	337	337
Villa-Real de St. Antonio (Portugal) to Cadiz	1888	1	83	83
Cadiz to Gibraltar	1888	1	83	83
Carried forward		9	3,547	3,547

LANDING PLACES.	Date of Laying.	No. of Conductors in each Section.	LENGTH IN NAUTICAL MILES.	
			Of Cables.	Of Conductors.
Brought forward		9	3,547	3,547
Cable (across Tagus):				
Belem (Portugal) (No. 1).....	1869	4	1	4
Belem (Portugal) (No. 2).....	1869	4	1	4
2nd.—SYSTEM WEST OF MALTA.				
Gibraltar to Tangier.....	1887	1	33	33
Gibraltar to Malta (No. 1).....	1870	1	1,118	1,118
Gibraltar to Malta (No. 2).....	1887	1	1,126	1,126
Marseilles (France) to Bona (Algeria) (No. 1).....	1870	1	447	447
Marseilles (France) to Bona (Algeria) (No. 2).....	1877	1	463	463
Bona to Malta (No. 1).....	1870	1	381	381
Bona to Malta (No. 2).....	1877	1	383	383
Malta to Tripoli (Africa).....	1882	1	204	204
Valetta (Malta) to Alagrande, near Modica (Sicily).....	1859	1	60	60
Valetta (Malta) to Pozzallo, near Modica (Sicily).....	1869	1	54	54
Malta to Zante.....	1887	1	374	374
3rd.—ITALO-GREEK SYSTEM.				
Otranto (Italy) to Zante (Greece).....	1874	1	189.13	189.13
Torre del Orso, near Otranto, to Bay of Sidari (Corfu).....	1861	1	64	64
4th.—AUSTRO-GREEK SYSTEM.				
Trieste (Austria) to Corfu.....	1882	1	503	503
5th.—GREEK SYSTEM.				
Zante to Katacolo (Morea).....	1884	1	26.57	26.57
Kalamaki (Morea) to Piræus.....	1884	1	30.54	30.54
Kalamaki (Morea) to Piræus.....	1889	1	31.22	31.22
Corinth (Morea) to Patras (Morea) (No. 1).....	1884	1	68.16	67
Corinth (Morea) to Patras (Morea) (No. 2).....	1889	1	75.45	75.45
Patras (Morea) to Zante (No. 1).....	1884	1	57.26	57.26
Patras (Morea) to Zante (No. 2).....	1887	1	56	56
Zante to Corfu.....	1871	1	175	175
Syra to Piræus.....	1873	1	81.49	81.49
Patras Narrows.....	1887	1	1.20	1.20
6th.—TURKO-GREEK SYSTEM.				
Zante to Canea (Candia).....	1873	1	256	256
Syra to Candia.....	1878	1	134	134
Syra to Chio (No. 1).....	1873	1	96.22	96.22
Syra to Chio (No. 2).....	1885	1	90.267	90.267
7th.—TURKISH SYSTEM.				
Canea to Rettimo (Candia).....	1871	1	34	34
Rettimo to Candia.....	1871	1	42	42
Candia to Sitia (Candia).....	1871	1	56	56
Sitia to Rhodes, comprising the sections:				
I. Sitia to Scarpanto.....	1871	1	145	145
II. Scarpanto to Rhodes.....	1871	1	10	10
Chio to Tchesmé (Turkey in Asia).....	1871	1	10	10
Chio to Tchesmé.....	1888	1	8	8
Chio to Tenedos.....	1878	1	98	98
Tenedos to Lemnos.....	1884	1	58	58
Lemnos to Salonica.....	1884	1	140	140
Tenedos to Chanac (Anatolia).....	1878	1	31	31
Chanac to Kartal (Bosphorus).....	1878	1	145	145
Rumlie Hissar to Anatolia Hissar (Bosphorus).....	1878	1	1	1
8th.—EGYPTO-EUROPEAN SYSTEM.				
Malta to Alexandria (Egypt) (No. 1).....	1868	1	927	927
Malta to Alexandria (Egypt) (No. 2).....	1870	1	914	914
Sitia (Candia) to Alexandria.....	1873	1	360	360
Larnaca (Cyprus) to Alexandria.....	1878	1	328	328
Carried forward.....		60	13,424.507	13,429.347

LANDING PLACES.	Date of Laying.	No. of Conductors in each Section.	LENGTH IN NAUTICAL MILES.	
			Of Cables.	Of Conductors.
Brought forward.....		60	13,424.507	13,429.347
9TH.—EGYPTIAN SYSTEM.				
Alexandria to Port Said.....	1882	1	155	155
10TH.—EGYPTO-INDIAN SYSTEM.				
Suez (Egypt) to Suakim (Soudan).....	1884	1	936	936
Suakim to Perim (Island).....	1884	1	597	597
Perim to Aden.....	1884	1	104	104
Perim to Obok.....	1889	1	52.029	52.029
Suez (Egypt) to Aden (No. 2).....	1870	1	1,444	1,444
Suez (Egypt) to Aden (No. 3).....	1876	1	1,403	1,403
Aden to Bombay (No. 1).....	1870	1	1,859	1,859
Aden to Bombay (No. 2).....	1877	1	1,885	1,885
		69	21,859.536	21,864.376
VIII.—EASTERN AND SOUTH AFRICAN TELEGRAPH COMPANY.				
<i>Head Office, Winchester House, 50, Old Broad Street, London, E.C.</i>				
Aden to Zanzibar.....	1879	1	1,909	1,909
Zanzibar to Mozambique (No. 1).....	1879	1	644	644
Zanzibar to Mozambique (No. 2).....	1885	1	686	686
Mozambique to Lour-neo-Marques (Delagoa Bay).....	1879	1	970	970
Lourenço-Marques to Durban (Natal).....	1879	1	345	345
Cape Town to Port Nolloth.....	1889	1	433	433
Port Nolloth to Mossamedes.....	1889	1	1,052	1,052
Mossamedes to Benguela.....	1889	1	236	236
Benguela to Loanda.....	1889	1	296	296
		9	6,571	6,571
IX.—EASTERN EXTENSION, AUSTRALASIA AND CHINA TELEGRAPH COMPANY.				
<i>Head Office, Winchester House, 50, Old Broad Street, London, E.C.</i>				
Madras to Penang.....	1870	1	1,455	1,455
Rangoon to Penang.....	1877	1	864	864
Penang to Malacca.....	1879	1	275	275
Malacca to Singapore.....	1879	1	116	116
Penang to Singapore.....	1870	1	415	415
Singapore to Saigon (Cochin China).....	1871	1	637	637
Haiphong (Tonkin) to Hong Kong.....	1884	1	464	464
Saigon to Hong Kong (China).....	1871	1	983	983
Hong Kong to Macao.....	1884	1	38	38
Hong Kong to Cape Bolinao (Island of Luzon).....	1880	1	529	529
Singapore to Batavia (Java).....	1870	1	539	539
Singapore to Banjoewangie (Java).....	1879	1	920	920
Banjoewangie to Port Darwin (Australia) (No. 1).....	1871	1	1,137	1,137
Banjoewangie to Port Darwin (Australia) (No. 2).....	1879	1	1,133	1,133
Banjoewangie to Roebuck Bay (Australia).....	1889	1	890	890
Flinders, near Melbourne (Victoria), to Low Heads (Tasmania) (No. 1).....	1869	1	180	180
Flinders, near Melbourne (Victoria), to Low Heads (Tasmania) (No. 2).....	1885	1	180	180
Botany Bay, near Sydney (New South Wales), to Blind Bay, near Nelson (New Zealand).....	1876	1	1,283	1,283
Hong Kong to Foochow.....	1883	1	475	475
Foochow to Shanghai.....	1883	1	445	445
		20	12,958	12,958

LANDING PLACES.	Date of Laying.	No. of Conductors in each Section.	LENGTH IN NAUTICAL MILES.	
			Of Cables.	Of Conductors.
X.—ANGLO-AMERICAN TELEGRAPH COMPANY.				
Head Office, 26, Old Broad Street, London, E.C.				
1ST.—TRANSATLANTIC SYSTEM.				
Valentia (Ireland) to Heart's Content (Newfoundland).....	1873	1	1,885.97	1,885.97
Valentia (Ireland) to Heart's Content (Newfoundland).....	1874	1	1,846.13	1,846.13
Valentia (Ireland) to Heart's Content (Newfoundland).....	1880	1	1,890.49	1,890.49
Mimou, near Brest (France), to St. Pierre.....	1869	1	2,685.24	2,685.24
2ND.—EUROPEAN COMMUNICATION.				
Salcombe (England) to Brignogan (France).....	1870	1	101	101
3RD.—COMMUNICATION ON AMERICAN COASTS.				
Heart's Content to Placentia (Newfoundland).....	1873	1	61.80	61.80
Heart's Content to Placentia (Newfoundland).....	1880	1	61	61
New Brunswick to Prince Edward's Isle.....	1856	1	12	12
Placentia to St. Pierre.....	1880	3	111.96	335.88
St. Pierre to Sydney (Cape Breton).....	1880	3	187.11	561.33
Placentia to Sydney.....	1873	1	314.12	314.12
Placentia to Sydney.....	1873	1	280.51	280.51
St. Pierre to Duxbury, near Boston (Massachusetts).....	1869	1	759.12	759.12
XI.—DIRECT UNITED STATES CABLE COMPANY.		17	10,196.45	10,794.59
Head Office, Winchester House, 50, Old Broad Street, London, E.C.				
Ballinskellig's Bay (Ireland) to Halifax.....	74.75	1	2,565.24	2,565.24
Tor Bay to Rye Beach (New Hampshire, U.S.).....	1875	1	536.09	536.09
XII.—COMPAGNIE FRANÇAISE DU TÉLÉGRAPHE DE PARIS À NEW YORK.		2	3,101.33	3,101.33
Head Office, 53 bis, Rue de Chateaudun, Paris.				
Brest (France) to St. Pierre.....	1879	1	2,242.37	2,242.37
St. Pierre to Cape Cod (Massachusetts).....	1879	1	827.30	827.30
St. Pierre to Louisbourg (Nova Scotia).....	1879	1	188.77	188.77
Isolin, near Brest (France), to Porcella Cove (Cornwall).....	1880	1	150.90	150.90
XIII.—WESTERN UNION TELEGRAPH COMPANY.		4	3,409.34	3,409.34
Head Office, Broadway, New York.				
London Agency, 213, Gresham House, Old Broad Street, E.C.				
1ST.—TRANSATLANTIC SYSTEM.				
Seamen Cove, near Penzance, to Dover Bay, near Canzo (Nova Scotia), Northern cable.....	1881	1	2,531	2,531
Seamen Cove, near Penzance, to Dover Bay, near Canzo (Nova Scotia), Southern cable.....	1882	1	2,576	2,576
2ND.—GULF OF MEXICO SYSTEM.				
Punta-Rassa (Florida) to Havana (Cuba), comprising the sections: I. Punta-Rassa to Key West..... II. Key West to Havana.....	1868	1	215	215
Punta-Rassa (Florida) to Havana (Cuba), comprising the sections: I. Punta-Rassa to Key West..... II. Key West to Havana.....	1873	1	215	215
	4		5,537	5,537

LANDING PLACES.	Date of Laying.	No. of Conduct- ors in each Sec- tion.	LENGTH IN NAUTICAL MILES.	
			Of Cables.	Of Conductors.
XIV.—THE COMMERCIAL CABLE COMPANY.				
<i>1, Broadway, New York; 26 Avenue de l'Opéra, Paris; 23 Royal Exchange, London, E.C.</i>				
1ST.—COMMUNICATION IN EUROPE.				
Havre to Waterville (Ireland).....	1885	1	510 15	510 15
Waterville to Weston-super-Mare (near Bristol).....	1885	2	328 88	657 76
2ND.—TRANSATLANTIC SYSTEM.				
Waterville (Ireland) to Canso (Nova Scotia).....	1884	1	2,350 36	2,350 36
Waterville (Ireland) to Canso (Nova Scotia).....	1884	1	2,388 35	2,388 35
3RD.—COMMUNICATIONS ON THE AMERICAN COAST.				
Canso (Nova Scotia) to New York.....	1884	1	840 93	840 93
Canso to Rockport (near Boston).....	1885	2	518 94	1 037 88
		8	6,937 61	7,785 43
XV.—BRAZILIAN SUBMARINE TELEGRAPH COM- PANY.				
<i>Head Office, Winchester House, Old Broad Street, London, E.C.</i>				
Carcavellos, near Lisbon (Portugal), to Madeira.....	1874	1	626	626
Carcavellos, near Lisbon (Portugal), to Madeira.....	1882	1	627	627
Madeira to St. Vincent (Cape Verde Island).....	1874	1	1,209	1,209
Madeira to St. Vincent (Cape Verde Island).....	1884	1	1,168	1,168
St. Vincent to Pernambuco (Brazil).....	1874	1	1,872	1,872
St. Vincent to Pernambuco (Brazil).....	1884	1	1,862	1,862
		6	7,364	7,364
XVI.—AFRICAN DIRECT TELEGRAPH COMPANY.				
<i>Head Office, Winchester House, Old Broad Street, London, E.C.</i>				
St. Vincent to Santiago (Cape Verde Islands).....	1884	1	193	193
Santiago to Bathurst (British possession).....	1886	1	471	471
Bathurst to Sierra Leone.....	1886	1	463	463
Sierra Leone to Accra.....	1886	1	1,020	1,020
Accra to Lagos.....	1886	1	259	259
Lagos to Brass.....	1886	1	269	269
Brass to Bonny.....	1886	1	68	68
		7	2,743	2,743
XVII.—CUBA SUBMARINE TELEGRAPH COM- PANY.				
<i>Head Office, 50 Old Broad Street, London, E.C.</i>				
Batabano (Cuba) to Cienfuegos (Cuba).....	1870	1	120	120
Cienfuegos to Santiago (Cuba).....	1870	1	400	400
Cienfuegos to Santiago (Cuba).....	1875	1	420	420
		3	940	940
XVIII.—WEST INDIA AND PANAMA TELEGRAPH COMPANY.				
<i>Head Office, Dashwood House, 9 New Broad St., London, E.C.</i>				
Santiago (Cuba) to Holland Bay (Jamaica).....	1870	1	160	160
Santiago (Cuba) to Holland Bay (Jamaica).....	1878	1	146	146
Kingston (Jamaica) to Colon (Isthmus of Panama).....	1870	1	630	630
Holland Bay to St. Juan (Porto Rico).....	1870	1	683	683
St. Juan to St. Thomas.....	1871	1	72	72
Carried forward.....		5	1,691	1,691

LANDING PLACES.	Date of Laying.	No. of Conductors in each Section.	LENGTH IN NAUTICAL MILES.	
			Of Cables.	Of Conductors.
Brought forward.....		5	1,691	1,691
Holland Bay to Ponce (Porto Rico).....	1874	1	647	647
Ponce to St. Croix.....	1875	1	135	135
St. Croix to St. Thomas.....	1875	1	48	48
St. Thomas to St. Kitts.....	1871	1	161	161
St. Kitts to Antigua.....	1871	1	49	49
Antigua to Basse-Terre (Guadaloupe).....	1871	1	73	73
Basse-Terre to Dominica.....	1871	1	51	51
Dominica to Martinique.....	1871	1	40	40
Martinique to St. Lucia.....	1871	1	55	55
St. Lucia to St. Vincent.....	1871	1	58	58
St. Vincent to Barbadoes.....	1871	1	99	99
St. Vincent to Grenada.....	1871	1	84	84
Grenada to Trinidad.....	1871	1	89	89
St. Croix to Port of Spain (Trinidad).....	1875	1	541	541
Trinidad to Demerara (English Guinea).....	1871	1	298	298
		20	4,119	4,119
XIX.—SOCIÉTÉ FRANÇAISE DES TÉLÉGRAPHES SOUS-MARINS.				
<i>Head Office, 32 Rue Caumartin, Paris.</i>				
Aguadores (near Santiago de Cuba) to Caimanera (Cuba).....	1888	1	50	50
Caimanera (Cuba) to Môle-St.-Nicolas (Hayti).....	1888	1	126	126
Môle-St.-Nicolas (Hayti) to Puerto-Plata (Dominique).....	1888	1	188	188
St. Domingue (Dominique) to Curaçao.....	1888	1	453	453
Curaçao to La Guayra (Venezuela).....	1888	1	163	163
		5	980	980
XX.—WESTERN AND BRAZILIAN TELEGRAPH COMPANY.				
<i>Head Office, 19 Great Winchester Street, London, E.C.</i>				
Para (Brazil) to Maranham (Brazil).....	1873	1	381	381
Maranham to Ceara (Brazil).....	1873	1	406	406
Ceara to Pernambuco (Brazil).....	1873	1	476	476
Pernambuco to Bahia.....	1873	1	396	396
Bahia to Rio de Janeiro.....	1873	1	837	837
Rio de Janeiro to Santos.....	1874	1	230	230
Santos to St. Catarina (Brazil).....	1874	1	292	292
St. Catarina to Rio Grande do Sul (Brazil).....	1874	1	394	394
Rio Grande do Sul to Montevideo (Uruguay), comprising the sections : I. Rio Grande do Sul to Chuy (Brazil)..... II. Chuy to Maldonado (Uruguay)..... III. Maldonado to Montevideo (Uruguay).....	1875	1	350	350
		9	3,762	3,762
XXI.—RIVER PLATE TELEGRAPH COMPANY.				
<i>Head Office, Montevideo.</i>				
Montevideo to Buenos Ayres (Argentine Republic).....		2	32	64
XXII.—MEXICAN TELEGRAPH COMPANY.				
<i>Head Office, 37 and 39, Wall Street, New York.</i>				
Galveston (Texas) to Tampico (Mexico).....	1882	1	490	490
Tampico to Vera Cruz (Mexico).....	1880	1	219	219
		2	709	709

LANDING PLACES.	Date of Laying.	No. of Conductors in each Section.	LENGTH IN NAUTICAL MILES.	
			Of Cables.	Of Conductors.
XXIII.—CENTRAL AND SOUTH AMERICAN TELEGRAPH COMPANY.				
<i>Head Office, 37 and 39 Wall Street, New York.</i>				
1ST ATLANTIC SYSTEM.				
Vera Cruz (Mexico) to Goatzacoalcos (Mexico).....	1881	1	129 50	129 50
2ND PACIFIC SYSTEM.				
Salina Cruz (Mexico) to Libertad (Salvador).....	1882	1	434 50	434 50
Libertad to San Juan del Sur (Nicaragua).....	1882	1	269 36	269 36
San Juan del Sur to San Pedro Gonzalez (Pearl Islands).....	1882	1	671 19	671 19
San Pedro Gonzalez to Panama.....	1882	1	48 37	48 37
San Pedro Gonzalez to Buenaventura (Colombia).....	1882	1	357 14	357 14
Buenaventura to St. Elena (Equator).....	1882	1	484 68	484 68
St. Elena to Payta (Peru).....	1882	1	230 37	230 37
Payta to Chorillos, near Callao-Lima (Peru).....	1882	1	553	553
		9	3,178 11	3,178 11
XXIV.—WEST COAST OF AMERICA TELEGRAPH COMPANY.				
<i>Head Office, Winchester House, 50 Old Broad Street, E.C.</i> <i>General Agency, Plaza de Micho, Lima.</i>				
Chorillos, near Callao-Lima (Peru), to Mollendo (Peru).....	1875	1	510 08	510 08
Mollendo to Arica (Peru).....	1875	1	146 42	146 42
Arica to Iquique (Peru).....	1875	1	128 35	128 35
Iquique to Antofagasta (Bolivia).....	1875	1	250 50	250 50
Antofagasta to Caldera (Chili).....	1875	1	229	229
Caldera to Serena, near Coquimbo (Chili).....	1876	1	215 34	215 34
Serena to Valparaiso (Chili).....	1876	1	219 03	219 03
		7	1,698 72	1,698 72

LAND-LINE WIRES OF THE WORLD.

Country.	Length.	Value.
	Miles.	£
Europe.....	1,002,794	25,069,850
North America—		
Western Union.....	616,130	17,240,000
Other lines.....	107,347	5,367,350
South and Central America.....	62,517	3,125,850
Australasia.....	71,717	3,585,850
Asia.....	128,928	6,446,400
Africa.....	12,969	648,450
Total.....	2,002,402	61,483,750

COMPARATIVE Distances—Liverpool to Yokohama.

Routes.	Geo- graphical Miles.
<i>Canada—North America.</i>	
1. Quebec and Vancouver—Present summer route, the shortest across the continent, comprising 3,054 S. M., or 2,649 G. M. of railway, not stopping at Montreal.....	9,673
2. St. John, Montreal and Vancouver—By short line, <i>via</i> Mattawamkeag, State of Maine and Sherbrooke, comprising 3,387 S. M., or 2,938 G. M. of railway.....	10,001
3. Halifax, Quebec and Vancouver—By the Intercolonial and Canadian Pacific Railways. Present winter route, comprising 3,732 S. M.=3,237 G. M. of railway direct.....	10,100
<i>United States—North America.</i>	
4. Boston, Chicago and San Francisco—The shortest route of the United States, comprising 3,432 S. M.=2,977 G. M. of railway.....	10,342
<i>Europe and Asia.</i>	
5. Gibraltar, Suez Canal, Strait of Malacca and Singapore.....	11,043
6. do do and Strait of Sunda.....	11,629
<i>Central America.</i>	
7. Bermuda and Jamaica on North Atlantic Ocean and Caribbean Sea, Panama Canal and North Pacific Ocean.....	12,814

LIVERPOOL, England, to Yokohama, Japan.

Routes.	Geo- graphical Miles.	Statute Miles.
<i>Louisbourg and Quebec.</i>		
Liverpool to Louisbourg, C.B.—Atlantic Ocean.....	2,350	2,709
Louisbourg to Quebec <i>via</i> Intercolonial Railway.....	714	823
Quebec to Vancouver direct <i>via</i> Canadian Pacific Railway.....	2,649	3,064
Vancouver to Yokohama—Pacific Ocean.....	4,363	5,029
		10,076
<i>Louisbourg and Montreal, <i>via</i> Short Line.</i>		
Liverpool to Louisbourg—Atlantic Ocean.....	2,350	2,709
Louisbourg to Vancouver <i>via</i> St. John and Sherbrooke.....	3,300	3,804
Vancouver to Yokohama—Pacific Ocean.....	4,363	5,029
		10,013
<i>Halifax and Quebec.</i>		
Liverpool to Halifax—Atlantic Ocean.....	2,500	2,882
Halifax to Vancouver direct—Canadian Pacific Railway.....	3,237	3,732
Vancouver to Yokohama—Pacific Ocean.....	4,363	5,029
		10,100
<i>Halifax and Montreal <i>via</i> Short Line.</i>		
Liverpool to Halifax—Atlantic Ocean.....	2,500	2,882
Halifax to Vancouver <i>via</i> St. John and Sherbrooke.....	3,179	3,664
Vancouver to Yokohama—Pacific Ocean.....	4,363	5,029
		10,042
<i>St. John and Quebec.</i>		
Liverpool to St. John, N.B.—Atlantic Ocean.....	2,700	3,112
St. John to Vancouver <i>via</i> Moncton—Intercolonial Railway.....	3,153	3,635
Vancouver to Yokohama—Pacific Ocean.....	4,363	5,029
		10,216
		11,776

LIVERPOOL, England, to Yokohama, Japan—*Concluded.*

Routes.	Geo- graphical Miles.	Statute Miles.
<i>St. John and Montreal via Short Line.</i>		
Liverpool to St. John, N.B.—Atlantic Ocean.....	2,700	3,112
St. John to Vancouver via Vanceboro and Sherbrooke.....	2,938	3,387
Vancouver to Yokohama—Pacific Ocean.....	4,363	5,029
<i>St. Andrews and Quebec via Temiscouata.</i>		
Liverpool to St. Andrews, N.B.—Atlantic Ocean.....	10,001	11,528
St. Andrews, via Edmunston and Temiscouata Railway, Intercolonial Railway and Canadian Pacific Railway, to Vancouver.....	2,680	3,089
Vancouver to Yokohama—Pacific Ocean.....	3,007	3,467
<i>St. Andrews and Montreal via Short Line.</i>		
Liverpool to St. Andrews, N.B.—Atlantic Ocean.....	10,050	11,585
St. Andrews to Vancouver via Vanceboro and Sherbrooke.....	2,680	3,089
Vancouver to Yokohama—Pacific Ocean.....	2,905	3,349
<i>Quebec and Vancouver.</i>		
Liverpool to Quebec via Belle-Ile—Atlantic Ocean.....	9,948	11,467
Quebec to Vancouver, direct—Canadian Pacific Railway.....	2,661	3,067
Vancouver to Yokohama—Pacific Ocean.....	2,649	3,054
<i>Total via Strait of Belle-Ile.....</i>		
ADD—If route is by Cape Race, Newfoundland.....	4,363	5,029
<i>Total via Cape Race.....</i>		
	9,673	11,150
	158	182
	9,831	11,332

DETAILS.

Louisbourg to Quebec—By Intercolonial Railway.....	823
Halifax do do.....	678
St. John do do.....	581
St. Andrews do By Temiscouata Railway.....	413
Quebec to Montreal—By Canadian Pacific Railway.....	172
Louisbourg do By Short Line Railway.....	888
Halifax do do.....	758
St. John do do.....	481
St. Andrews do do.....	443
Montreal to Ottawa—By Canadian Pacific Railway.....	120
do Winnipeg do.....	1,424
Winnipeg to Vancouver do.....	1,482
Quebec to Winnipeg via Montreal.....	1,596
do via St. Martin, direct.....	1,572
Quebec to Vancouver do.....	3,054
do via Montreal.....	3,078
Sydney, Cape Breton to Quebec—By Intercolonial Railway.....	832
do to Montreal via Moncton, St. John, Vanceboro and Sherbrooke—By Short Line across State of Maine, U.S.....	907

COMPARATIVE Statement of Distances between Liverpool, England, and Yokohama, Japan, on the respective Routes indicated through Canada *viâ* Port Moody and Vancouver.

Routes.	Geo- graphical Miles.	Statute Miles.
1. Quebec, Ottawa and Vancouver <i>viâ</i> Strait of Belle-Ile.....	9,673	11,150
2. do do do Cape Race.....	9,831	11,332
3. Quebec, Ottawa, Owen Sound, Lakes Huron and Superior and Vancouver <i>viâ</i> Cape Race.....	9,846	11,350
4. Chatham, Quebec, Ottawa and Vancouver <i>viâ</i> Cape Race—Projected.....	9,847	11,351
5. St. Andrew's, Mattawamkeag, Sherbrooke, Montreal, Ottawa and Vancouver	9,948	11,467
6. St. John do do do do ..	10,001	11,528
7. Louisbourg do do do do ..	10,013	11,542
8. Halifax, St. John do do do do ..	10,042	11,575
9. St. Andrew's, Edmundston, Rivière du Loup, Quebec, Ottawa and Vancouver	10,050	11,585
10. Louisbourg, Quebec, Montreal, Ottawa and Vancouver.....	10,076	11,615
12. Quebec, Montreal, Toronto, Detroit, Chicago, St. Paul, Winnipeg and Van- couver <i>viâ</i> Cape Race.....	10,076	11,615
13. Halifax, Quebec, Montreal, Ottawa and Vancouver.....	10,100	11,643
14. St. John, Moncton, Quebec, Montreal, Ottawa and Vancouver.....	10,216	11,776

COMPARATIVE STATEMENT of Distances between Liverpool, England and Yokohama, Japan, on the respective Routes indicated through the United States *viâ* San Francisco.

Routes.	Geo- graphical Miles.	Statute Miles.
1. Boston, Chicago and San Francisco.....	10,342	11,921
2. Portland, Niagara Falls, Chicago and San Francisco	10,404	11,992
3. Portland, Montreal, Chicago and San Francisco.....	10,416	12,006
4. New York, Chicago and San Francisco.....	10,493	12,095
5. New York, Indianapolis, St. Louis and San Francisco.....	10,600	12,219
6. New York, Cincinnati, St. Louis and San Francisco.....	10,637	12,262
7. Boston, St. Louis and San Francisco.....	10,641	12,266
8. Philadelphia, Chicago and San Francisco.....	10,683	12,314
9. Philadelphia, Indianapolis, St. Louis and San Francisco	10,703	12,337
10. Philadelphia, Cincinnati, St. Louis and San Francisco	10,740	12,380
11. Richmond, Louisville, St. Louis and San Francisco.....	10,757	12,397
12. Baltimore, Chicago and San Francisco.....	10,766	12,410
13. Richmond, Cincinnati, St. Louis and San Francisco	10,826	12,478
14. Baltimore, Cincinnati, St. Louis and San Francisco	10,830	12,484
15. Richmond, New Orleans and San Francisco.....	10,845	12,499
16. Baltimore, Indianapolis, St. Louis and San Francisco.....	10,861	12,519
17. New Orleans and San Francisco.....	11,339	13,069

NOTE.—The longest route across Canada is shorter than the shortest route across the United States.—
G. F. B.

PART III.

PROGRESSIVE DISCOVERIES

AND

FOUNDATIONS OF VARIOUS CITIES, TRADING STATIONS, &c., IN
NORTH AMERICA, COLONIZED BY FRANCE
AND GREAT BRITAIN.

PROGRESSIVE DISCOVERIES.

Iceland, Greenland, Labrador, Newfoundland, North America and Canada.

Localities.	Discoverers.	Dates of Discovery.
Iceland (Thule).....	Pytheas, a Geographer and Navigator, born at Marseilles, France.....	Before Christ. 340
do (Snowland).....	Norsemen, under Norse Viking Naddodd.....	After Christ. 520
do (Gardar's Holm).....	Gardar, a Swede—re-discovered it.....	864
Greenland.....	Gunnbjorn, son of Ulf Krage, of Iceland.....	876
do.....	Explored by Eirik (Erick) the Red, from Norway and Iceland.....	984
Coast of Labrador and Newfoundland (Helluland) land of broad stones, whence they proceeded to Markland, Nova Scotia (Land of Woods), Vinland, Massachusetts, United States....	According to Northern Sagas, first seen by Biorn (Biarni) and 14 years later by Eirik the Red and Leif, his son, whom Humboldt calls "The Discoverer of the New World".....	1000
America.....	Christopher Columbus.....	Oct. 12, 1492
Labrador, Newfoundland, Cape Breton and Coast of United States.....	John Cabot and Sebastien, his son, from Venice, Cape North, Cape Breton, first seen.....	June 24, 1497
Hudson's Bay.....	Sebastien Cabot is reported to have discovered this bay before Hudson.....	1498
Newfoundland, Greenland, Labrador.....	Gaspard Corté Real, Portuguese Navigator.....	1500
Newfoundland, Labrador, Canada.....	Jacques Cartier—Isle of Birds—first seen.....	June 25, 1534
Stadacona (Quebec).....	do.....	Sept. 14, 1535
Hochelaga (Montreal).....	do.....	Oct. 2, 1535
Tadoussac, Outlet River Saguenay.....	Samuel De Champlain and Pontgrave.....	May 24, 1603
Lake Champlain, or "Lac des Iroquois".....	do.....	July 1609
Hudson's Bay.....	Henry Hudson. (See hereafter).....	1610
Ottawa River, or "Rivière des Algonquins".....	Samuel De Champlain.....	June 1613
Lake Nipissing.....	do.....	1615
Lake Huron (Mer Douce).....	do.....	July 1615
Lake Ontario, or "Frontenac".....	do.....	1615
Lake Michigan, or "Lac des Illinois".....	Jean Nicolet.....	1634
Lake Erie.....	Jesuit Fathers, Pierre-Joseph-Marie Chamonot and Jean De Brebeuf.....	1640
Lake George, or "Lac du St. Sacrament," above Lake Champlain.....	Jesuit Father, Isaac Jogues.....	1646
St. John, "Pikouagami".....	Jesuit Father, Jean De Quen.....	July 16, 1647
Lake Superior, or "Lac de Tracy".....	French Traders.....	1659
Hudson's Bay.....	Henry Hudson. (Some authors pretend that Sebastien, son of John Cabot, discovered this Bay towards 1498).....	1610
Behring Strait. See below.....	Jean Bourdon took possession of it for France.....	1656
James Bay, Head of Hudson's Bay.....	Pierre Le Moine d'Hervey took possession of Albany Fort, Moose Factory and Rupert.....	1685
Mississippi River or "Fleuve de Colibert".....	And of York Factory.....	1694
Niagara Falls.....	Deschnew, a Russian sailed through before Behring.....	1648
Mississippi River, descended to the Sea, by Behring Strait Re-discovered.....	Jesuit Father Charles Albanel.....	June 28, 1672
Rocky Mountains reached.....	Louis Joliet and Jesuit Father Jacques Marquette.....	do 17, 1673
Mackenzie River to Polar Sea.....	Rev. Father Recollet, Louis Hennepin who accompanied Rene-Robert Cavalier de La Salle.....	1678
Vancouver Island, circumnavigated.....	R. R. Cavalier de La Salle.....	April 9, 1683
Rocky Mountains crossed, <i>via</i> Peace.....	Behring, a Danish navigator employed by Peter the Great.....	1729
	Pierre Gaultier de Varennes de La Verandrye.....	Jan. 12, 1743
	Sir A. Mackenzie descended to Whale Island.....	July 15, 1789
	Vancouver, an English navigator.....	1790

Progressive Discoveries—Concluded.

Localities.	Discoverers.	Dates of Discovery.
Frazer and Salmon Rivers.....	Sir Alexander Mackenzie, of the North-West Co..	May 9, to July 22, 1793
Polar Sea, from Copper-Mine River to Cape Turnagain, West end, Dease Strait.....	Sir John Franklin and Dr. Richardson during first Expedition.....	July 18, to Aug. 18, 1821
Polar Sea, from Mouth of Mackenzie West, to Point Beechey, Alaska.....	Franklin and Lieut. Back, his first assistant, in two boats.....	July 8, to Aug. 17, 1826
East, to Mouth of Copper-Mine River	Dr. Richardson with two boats sent by Franklin..	July 8, to Aug. 8, 1826

FOUNDATIONS of Cities, &c., in "La Nouvelle-France" and in British North America.

Localities.	Founders.	Dates of Foundation.
Port Royal, on north side of Annapolis Basin opposite Goat Island.....	M. De Monts (site granted to M. de Poutrincourt).	1606
Quebec.....	Samuel de Champlain.....	July 3, 1608
St. John's, Newfoundland.....	Whitbourne.....	1613
Three Rivers.....	Laviolette.....	July 4, 1634
Port Royal (Annapolis), site of present town on south side of Annapolis Basin	D'Aulnay de Charnisay (Charles de Menou)....	1636-45
Ville-Marie (Montreal).....	Paul de Chomedey de Maisonneuve.....	May 18, 1642
Fort Richelieu (Sorel).....	Charles-Jacques Huault de Montmagny.....	Aug. 13, 1642
Cataracoui (Kingston).....	Louis de Buade, comte de Pallau et de Frontenac	June 13, 1673
Pontchartrain (Detroit).....	La Mothe Cadillac, under de Callières.....	July 24, 1701
Louisbourg, Cap Breton.....	French from Placentia, Newfoundland (afterwards by M. De Costebelle, who expended 30 millions of francs to fortify it).....	Aug. 1713
New Orleans.....	Le Moyne de Bienville.....	1718
Fort La Reine—Fort Garry—Winnipeg	Pierre Gaultier de Varennes de la Vérandrye.....	1737
La Présentation (Ogdensburg).....	Abbé Picquet.....	1748
Chibouctou (Halifax).....	Lord Cornwallis.....	June 30, 1749
Charlottetown, Prince Edward Island, formerly visited by Cabot in 1497, and named Ile St. Jean by Champlain.....	Morris and Deschamps. The Island was named "Prince Edward" in 1799. It was first settled by Acadians after 1715, and was definitely taken by the English 1758.....	1768
St. John, New Brunswick.....	United Empire Loyalists.....	May 18, 1783
Fredericton do.....	United Empire Loyalists.....	1784
Sydney, Cape Breton.....	Lt. Governor Des Barres.....	1785
Fort Rouille (Toronto).....	Jacques-Pierre de Taffanel, Marquis de la Jonquière, 16th Governor of La Nouvelle France, 1749-52.....	1793
Toronto (York).....	Governor John Graves Simcoe.....	1790
Belleville.....	Captain Myers.....	1797
Prescott.....	Major Edward Jessup.....	1797
St. Catharines (Welland).....	Founded.....	1797
Hull, Ottawa County, P.Q.....	Philemon Wright.....	March 7, 1800
Sherbrooke, P.Q.....	David Moe and others.....	1800
Hamilton, Ontario.....	Hamilton.....	1813
Ottawa do.....	Nicholas Sparks and others, 9 years before Rideau Canal was commenced.....	1817
Brantford do.....	About.....	1820
London do.....	Peter McGregor.....	1826
Guelph do.....	John Galt.....	April 23, 1827
Victoria, British Columbia.....	Governor Sir James Douglas.....	March 16, 1843
New Westminster, British Columbia.....	Col. R. C. Moody.....	Feb. 1859
Vancouver.....	Canadian Pacific Railway Company.....	1887
Burrard Inlet.....		

NOTE.—For the preceding and other information of interest, See the "Hand Book of Canadian Dates," by P. A. McCord, Assistant Law Clerk, House of Commons, Ottawa

FRENCH Forts, Lake Superior to Cumberland House, and on Hudson's Bay, prior to the Cession of Hudson's Bay to Great Britain by the Treaty of Utrecht, 11th April, 1783—and the English Forts then existing or subsequently built.

French Forts.	English Forts.	Situation and Remarks.
Kaministiquia.....	William.....	French Fort was on south side of River Kaministiquia. English Fort is on the north side, above outlet into Lake Superior, near Pacific Railway elevators.
St. Pierre.....	François.....	English Fort on north side of outlet of Rainy Lake into Rainy River. French Fort was on west side of outlet of Rainy River into Lake of the Woods at its south or upper end.
St. Charles.....		French Fort at head of Lake of the Woods, and on its west side, and upper portion.
Maurepas.....	Alexander.....	French Fort on north side of outlet of the River Maurepas or Winnipeg into Lake Winnipeg, towards its head and upon its east side. English Fort on south side of outlet of the River Winnipeg.
Rouge.....		French Fort on east side of outlet of Red River into the south or upper end of Lake Winnipeg.
.....	Selkirk.....	English Fort on west side of Red River about 14 miles south of upper end of Lake Winnipeg.
La Reine.....	Garry.....	French Fort, built by De la Vérandrye in 1737, on North side of outlet of Assiniboine, on West side of Red River. English Fort, in City of Winnipeg, nearly demolished, 1888.
Bourbon.....	Norway House.....	English Fort, at North end and on East side of foot of Lake Winnipeg. French Fort, on West side of same Lake, and on South side of outlet of River Saskatchewan.
Dauphin.....		At North end and on West side of Lake Manitoba.
Paskoyac.....	Cumberland House.....	French Fort, on South side of the North Saskatchewan. English Fort, near Pine Lake, on North side of Saskatchewan.
.....	Churchill.....	English Fort, at outlet of River Churchill, West side of Hudson's Bay.
Bourbon.....	York Factory.....	On tongue of land at mouth of Nelson and Hayes Rivers, or the Bourbon and Ste. Thérèse Rivers, on West side of Hudson's Bay. Taken by d'Iberville, 1694, and named Bourbon.
Niewasavanne.....	Severn.....	The first on East side, and the other on West side of outlet on River Severn, on the West side of Hudson's Bay.
Ste. Anne.....	Albany.....	French Fort, on West side of James' Bay, and South of Fort Albany, which was built by the English on an Island at the mouth of the Quitchitchouan or Albany River. English Fort, taken by d'Iberville, 1685.
St. Louis or Monsoni....	Moose Factory.....	Fort formerly built on East side of outlet of River Abitibi, on West side and at South end of James' Bay; now built on Island at outlets of Rivers Moose and Abitibi. Built by the English. Fort taken by d'Iberville, 20th June, 1685.
St. Charles.....	Rupert House.....	Built by the English on North side of the Rupert River, which is greater than the River Saguenay. This Fort is on East side and near South end of James' Bay. It was taken by d'Iberville, 2nd July, 1685.

HIGHEST LATITUDES attained—North. Arctic Regions and Polar Sea.

Dates.	Arctic Navigation.	Latitudes, North.			Longitudes.			Remarks.
		°	'	"	°	'	"	
1498	Sebastien Cabot, son of John.	63	0	0	W.	80	0	Hudson's Bay. Not certain.
1607	Henry Hudson.	80	23	0	E.	15	0	North of Spitzbergen.
1697	do	72	0	0	W.	20	0	E. coast Greenland. Hold-with-Hope.
1610	do	63	0	0	W.	80	0	Hudson's Bay.
		63	0	0	W.	95	0	
1773	C. J. Phipps.	80	48	0	E.			North of Franz Joseph Land.
1806	W. Scoresby, sen.	81	12	42				
Aug. 19, 1818	Admiral W. Parry and Capt. John Ross.	76	54	0	W.	72	30	North of Carey Island.
July —, 1827	Admiral W. Parry.	82	43	0	E.	19	15	North of Spitzbergen.
1845	Sir John Franklin.	77	0	0	W.	97	0	Up Wellington Channel, on east side of Cornwallis Island, to head of Bathurst Island and down west side of the former.
Aug. 27, 1852	Admiral Inglefield.	98	21	0	W.	74	45	Discovered Smith's Sound.
do 24, 1853	Elisha Kent Kane.	78	37	0	W.	70	40	Van Rensselaer Harbour.
June 1, 1854	Dr. Hayes, of Kane Exp.	79	43	0	W.	72	0	Cape Frazer and Grinnell Land.
May 11, 1861	Dr. Hayes.	80	0	0	W.	74	0	Cape Hawks.
Aug. 31, 1871	Capt. F. Hall, with "Polaris," Died of apoplexy, 8th Nov., 1871, before voyage was ended.	82	11	0	W.	54	0	N.W. of Repulse Harbour.
1872	Lieut. Julius Payer.	82	7	0	E.			Cape Fligely, Franz Joseph Lands, sledge journey.
do 31, 1875	Capt. George Nares, with the "Alert" and "Discovery."	82	25	0	W.	61	30	The "Alert" was moored near Cape Sheridan, Floeberg Beach, the highest latitude ever attained by any vessel.
Sept. 27, 1875	Lieut. Aldrich, of Nares' Exp.	83	7	0	W.	63	5	Sledge journey on Polar Sea.
					W.	87	30	Saw Cape Columbia, W.
May 12, 1876	Commander Markham and Lieut. Parr, of Nares' Exp.	83	20	26	W.	63	5	Planted British Flag on Polar Sea.
do 18, 1876	Lieut. Aldrich do	82	16	0	W.	83	33	Sledge journey to Cape Alert, near C. Alfred Ernest, Grinnell Land, Westward along Sea.
do 21, 1876	Lieut. L. A. Beaumont, of Nares' Exp.	82	20	0	W.	50	45	Sherard Osborn Fiord, sledge journey.
June 13, 1881	Lieut. Com. Geo. W. De Long, U.S.	77	15	0	E.	155	0	Polar Sea, westward of Bennett Island, north of Siberia, where his vessel the "Jeannette" was crushed by ice.
May 13, 1882	Lieut. Adolphus W. Greely, U.S.	83	24	0	W.	40	46	Lockwood Island, sledge journey by 2nd Lieut. J. B. Lockwood and Sergt. D. L. Brainard.

ACADIA - OR (Nova Scotia.
(New Brunswick.

ILE-ROYALE OR Cape Breton.

PORT-ROYAL OR Annapolis.

ILE ST.-JEAN OR Prince Edward Island.

1598 to 1783.

ACADIA (NOVA SCOTIA).

The first successful attempt at the colonization of Acadia (Nova Scotia) appears to have been made by Pierre du Guast, Sieur De Monts, under Henry the Fourth of France. The country was then frequented by the Mikmak Indians in the pursuit of game and fish. De Monts, who was appointed in 1603 Lieutenant-General of New France by the same sovereign, went in 1604 to Port Rossignol,—now Liverpool, N.S.—then the residence of a French trader named Rossignol, who was trading with the savages (Mikmaks) without license, and whose property he therefore confiscated.

He established numerous settlements and forts on various parts of Nova Scotia and New Brunswick.

Having explored the coast of the Bay of Fundy (La Baie du Fond or Baie des Français) he there established a town which was named Port Royal (1605), and was afterwards granted by France to M. de Poutrincourt, who had accompanied Champlain to Acadia and was an associate of De Monts, who had the exclusive privilege of the fur trade for ten years. This first Port Royal was on the north side of the Bay, nearly opposite Goat Island; it was abandoned in 1607, re-occupied in 1610, and destroyed in 1613 by the Virginians under Captain Argall, the Governor of Virginia, in the name of Great Britain.

The second Port Royal was built between 1634 and 1645, by D'Aulnay de Charnisay, on the south side of the bay, about six miles eastward from the first.

In 1621 the whole territory situated at the east of a line drawn from Ste. Croix River northwardly to the St. Lawrence was granted by James I to Sir William Alexander, afterwards Earl of Sterling. This nobleman gave to Acadia the name of Nova Scotia.

The Earl of Sterling, Sir William Alexander, conveyed to Claude de la Tour, a French traitor who had married an English lady and had been created one of the Baronets of Nova Scotia, or of the whole of that Province except Ile-Royale (Cap-Breton).

By the treaty of St. Germain-en-Laye, 29th March, 1632, Charles I agreed to render to France the Province of Acadia, whereupon Louis XIII divided it among a number of his subjects.

On 16th August, 1654, the second Port Royal was taken by Sedgewick.

On 9th August, 1656, the country, having been reconquered under Cromwell, was granted to Sir Thomas Temple, William Crowne and Charles de la Tour.

On 3rd November, 1655, the Westminster Treaty, affecting the forts at Pentagouet, St. John and Port Royal, was passed by France and England.

By the Treaty of Breda (City of Brabant) the country was again ceded to France, 31st July, 1667. The French population at that time was about 1,000; their settlements were chiefly at Port Royal, La Hève, Chedabucto, and on the banks of rivers emptying into the Bay of Fundy. The Mikmak warriors were estimated at 3,000.

In 1686 Great Britain declared war against France. In May, 1690, Sir William Phipps, a native of Massachusetts, attacked Port Royal, which was dilapidated and defended by only 90 troops; he also attacked Chedabucto; both places capitulated.

The French Governor, Villebon, who then arrived from France to take command of Acadia took possession of Port Royal. In 1696 he captured Fort Pemaquid between the Rivers Kennebec and Penobscot.

By the Treaty of Ryswick, 20th September, 1697, Acadia was restored to France.

Louis the XIV having acknowledged the Pretender as King of England, war was again declared, 4th May, 1710; this war lasted eleven years.

In September, 1710, General Nicholson, with 29 transports, four men of war and a tender conveying five regiments, besieged Port Royal, the commandant of which had only 260 effective men in garrison; he capitulated 13th October. Nicholson then named it Annapolis, in honour of Queen Anne, the reigning sovereign. Peace was concluded between England and France, 11th April, 1712.

By the Treaty of Utrecht, 11th April, 1713, Nova Scotia was definitely ceded to Great Britain as far as Ile Royale (Cap-Breton) which France had retained.

M. de Costebelle, under the French, in August, 1713, founded and commenced to fortify Louisbourg, the fortifications and outstanding forts of which were constructed from year to year until their final completion at the end of 25 years, and at a cost of about £1,500,000 sterling.

After the cession of Nova Scotia in 1713, a portion of the Acadians emigrated to Cap-Breton and other localities. Those who remained were settled at various localities along the Atlantic and Bay of Fundy coasts.

In 1744, France, under Louis XV, had declared war against England under George II. Du Quesnel who had succeeded M. Constable as Governor of Ile-Royale (Cap-Breton) fitted out an armament from Louisbourg under Du Vivier, who captured the English garrison at Canseau. Du Quesnel also despatched some irregular forces to Annapolis and other points; he died the same year and was succeeded by Duchambon.

On 7th May, 1745, Louisbourg was besieged by the combined fleets of Commander Warren from the West Indies and General Pepperrell with an army of 4,000 men from Massachusetts; the fortress was surrendered 16th June following.

During the summer of the same year, France despatched a formidable fleet of 70 vessels with 3,150 disciplined troops under the Duke d'Anville to re-establish her supremacy in North America; this fleet was disabled by a series of disasters; after a passage of 90 days, only seven of the vessels arrived in Chebucto harbour. A portion of the fleet returned to France under Admiral Jonquière, was reinforced by 38 sail and was on its way to New France when it was met and defeated by the English Admirals Anson and Warren off Cap Finisterre, 3rd May, 1747; La Jonquière was then taken prisoner.

The Colonies on hearing of the disaster to the fleet, had sent 470 troops to attack the Acadians residing at Grand Pré, but they were badly defeated 11th February, 1747.

By the treaty of Aix-la-Chapelle, 7th October, 1748, Cape Breton was restored to France.

On 17th August, 1749, La Jonquière was appointed Governor of New France, which he governed until the time of his death, 17th March, 1752.

Towards 1749 upwards of 1,000 Acadian families, comprising about 6,000 persons, occupied the lands for an extent of eight miles on the west side of River Avon, which discharges into the head of the Basin of Mines an arm of the

the Bay of Fundy; Grand Pré, their principal village in that locality is now named Lower Horton, one of the stations on the Windsor and Annapolis Railway; it is still called Grand Pré in that section of the country; it is one mile from the Horton Landing Station, 15 miles from Windsor and 60 miles from Halifax by rail.

FIRST EXPULSION AND TRANSPORTATION OF THE ACADIANS.

During the struggle between France and England for supremacy in North America, and the struggle between England and its Colonists under Washington for their Independence in the portions of the continent now forming part of the United States, 1732 to 1783, the Acadians then residing in Nova Scotia under English rule, were "Neutrals."

In 1755, under the reign of George II, Col. Charles Lawrence, the English Governor of Nova Scotia, and his Council, fearing that the Acadians might help to restore French rule in the Province, preconcerted a plan for their compulsory expulsion, although there was little to be apprehended, considering that the entire French population in Nova Scotia and New Brunswick at that time scarcely exceeded 10,000.

The Acadians were ordered to assemble at a stated hour, on the 10th September, 1755, in their respective localities, for the purpose of hearing the King's command, the nature of which was carefully concealed from them; little did they suspect that it was for their banishment and the confiscation of their properties.

The French settlers at Port Royal (Annapolis), and at Beau-Bassin (Cumberland) at the head of the Bay of Fundy, refused to comply with this arbitrary order, believing it was not in their interest; 2,200 of them went to Shediac and Ile St. Jean (Prince Edward Island), then under French rule.

Some were forced by starvation to return to their homesteads and were afterwards transported with their compatriots to various localities in North America; others remained with the Indians, and some reached various localities in the present Province of Quebec, at the Baie des Chaleurs, Magdalen Islands, Prince Edward Island and New Brunswick, etc.

At Cumberland Basin, the soldiery sent to subdue them, burnt their church, and 253 of their houses, with a great quantity of wheat and flax.

At Grand-Pré, 1,923 persons assembled and were made prisoners by the Bostonians and others from Massachusetts, who were the principal instigators of this unprecedented and tyrannical measure; they burnt 255 of their houses, 276 barns, and 155 of their outhouses; they also destroyed their church, and 11 of their mills; the Government of Nova Scotia also confiscated 20,858 heads of their cattle, horses, sheep, hogs, and all their properties.

At other settlements more than 5,000 Acadians complied with the arbitrary summons to assemble, and were made prisoners, besides which their properties were either destroyed or confiscated.

The total number of Acadians surprised and made prisoners on the 10th September, 1755, amounted to about 7,000.

The heads of families in many cases were separated from each other and from their children. They were embarked and placed in the holds of several old and leaky schooners leased from the agency of Apthorp & Hancock, of Boston, and other vessels, in the bottom of which they were packed promiscuously, without regard to age or sex, and shipped to various parts of the present United States as far as New Orleans.

During the voyage, which lasted from one to two months or more, upwards of 1,000 died, and their corpses were launched into the sea.

The Acadians on board of one of the vessels overpowered the captain, his mate and sailors, and sailed back to St. John's, New Brunswick, where they were hospitably received by M. de Boishébert, the French commandant.

The others were shipped to Massachusetts, Pennsylvania, Maryland, Virginia, Carolina, Georgia and Louisiana. The colonists in most cases would not even allow them to land, unless some provision was made for their maintenance. Six hundred of them were sent afterwards from New York to St. Domingo at a time when pestilence was depopulating the island. In Pennsylvania, where 415 had been sent, a portion of the citizens of Philadelphia proposed to sell them as slaves. They and their compatriots who had survived the miseries of the sea voyage, were landed at the various localities in a state of utter destitution, amongst a hostile population, and during one of the worst seasons of the year. Many of them afterwards died on account of the hardships they had to endure, and also from starvation.

In South Carolina, where a detachment of 2,000 had been sent, 900 of the survivors were compelled to leave and to embark on board of two old vessels, one of which they had to abandon, and the other to repair during two months. They afterwards reached their compatriots stationed on the river St. John.

Haliburton, speaking of the Acadians, observes that the whole course pursued toward them is a stain on the Provincial Government of Nova Scotia which nothing can justify, and which all men with any sense of humanity must condemn.

In May, 1756, the French Government, moved, no doubt, by the atrocious treatment of the Acadians, declared war against England.

Early in May, 1758, Admiral Boscawen reached Halifax, the rendez-vous of the British forces, from whence he sailed soon after and arrived off the harbour of Louisbourg on the 2nd of June, with a fleet of 151 ships and an army of 14,000 men, commanded by Generals Amherst, Whitmore and Wolfe.

Louisbourg surrendered on the 26th July, 1758.

In the fortress there were 231 pieces of cannon, 18 mortars and a large quantity of stores and ammunition.

The population of the town, exclusive of the troops, was about 5,000 men.

The strength of the garrison before the siege consisted of 2,500 regular troops and 300 militia who were reinforced by 340 Canadians and Indians.

The officers, soldiers and citizens, in all 5,637 men, were sent, the former to England and the latter to France.

The British, fearing that the fortress might again fall into the hands of the French, dismantled and destroyed it.

The French had settlements on various parts of the island, the principal of which were Bras-d'Or, Sydney, St. Peter's and Arichat, where the fisheries gave employment to 27,000 men and 600 vessels, exclusive of boats.

The fall of Louisbourg gave possession of the whole of Cape Breton, with its valuable mines and fisheries to Great Britain.

After the capture of Cape Breton, Lord Rollo was sent to Ile St.-Jean, where 4,100 Acadians surrendered in 1758. The name of the island was changed to that of Prince Edward in 1799.

This island was visited by Cabot in 1497, and was afterwards named Ile St. Jean by Champlain towards 1603; it was first settled by the Acadians after

the expulsion from Acadia (Nova Scotia); it was re-taken by the English in 1745, restored to France by the Treaty of Aix-la-Chapelle, 18th October, 1748, and finally retaken by the English in 1758.

Most of the Acadians were then expelled from their properties and compelled to leave the island. Some of them went to the Magdalen Islands, to the Baie des Chaleurs, Shediac and other localities.

By the Treaty of Paris, 10th February, 1763, the whole of the French possessions in Canada were ceded to England; the Islands of St. Pierre and Miquelon were reserved to France.

In 1763 the population of Nova Scotia which included New Brunswick, amounted to 13,000.

In 1772 the population of Nova Scotia and Cape Breton, including 2,100 Acadians and 865 Indians, amounted to 19,985.

In 1784 the population of Nova Scotia proper was about 20,000.

The independence of the United States having been acknowledged by France in 1778 and by Great Britain in 1783, 20,000 refugee Loyalists arrived in Nova Scotia, 5,000 of whom were landed in New Brunswick. The Acadians who were then settled in the valley of the River St. John had to abandon their properties for the benefit of the Loyalists.

SYNOPSIS.

EXPULSIONS OF THE ACADIANS.

The approximate number of Acadians who were expelled from the Maritime Provinces at various times was as follows :—

1. In 1755—7,000 from Nova Scotia, by order of Governor Lawrence, who appointed a day, 10th September, 1775, and an hour for them to assemble in their various localities, in order to communicate to them the King's command, the nature of which was carefully concealed from them.

These unsuspecting colonists who had complied with the summons were seized by officers and soldiers chiefly from Boston and Massachusetts; their churches, dwellings and barns were burnt and their properties confiscated, after which they were transported in several old schooners to various parts of the English Colonies of America. They were packed so close in the holds of leaky vessels and endured so much misery during their two months' voyage in February and March, that 1,000 of them died at sea. Another 1,000 were expelled from South Carolina and re-embarked on board of two old vessels with orders to leave the country; they went to St. John, N.B.; 650 more were expelled from New York and sent to St. Domingo during the time of the pestilence there.

2. In 1758—3,000 were made prisoners of war at Louisbourg and were shipped to England whence they were sent to France, by order of the British Government; many of these went to reside at Belle-Ile-en-mer.

3. In 1758—4,100 Acadian colonists on Ile St.-Jean (now Prince Edward Island) were expelled and their properties confiscated by Lord Rollo when he took possession of the island for Great Britain. Many of them went to settle along the southern coast of New Brunswick and on the Magdalen Islands, which are chiefly inhabited by Acadians at the present time.

4. In 1788—Upwards of 2,000, who were settled in the valley of the River St. John, were expelled, and their properties given to the United Empire Loyalists, 5,000 of whom were landed in New Brunswick.

ACADIAN FAMILIES SETTLED AT BELLE-ÎLE-EN-MER, FRANCE, 1765.

When l'Abbé LeLoutre returned to France, after his long captivity at Jersey Island, he worked for the Acadians with the same ardour and perseverance he had shown during his stay with them in Acadia.

On the 8th of November, 1765, he landed at Belle-Île-en-Mer, where he was followed by seventy-eight families of Acadians, whom the King wished to settle there. Belle-Île-en-Mer is a small island situated some leagues from the west coast of France, opposite Morbihan. It contains four parishes, Le Palais, or north centre; Bangor, or south centre; Sauzon, at the west end; and Locmaria, at the east end.

The Acadians, after their arrival, were divided between these four parishes. Each of the seventy-eight families received a concession of land; afterwards, at the request of l'Abbé LeLoutre, the King ordered 78 houses to be built, one for each family, to each of whom 1 horse, 1 cow, 3 sheep, and a sum of 400 French "livres," were also granted.

In order to remedy a deficiency in the parish registers respecting the origin of the Acadians, the States of Bretagne, who then ruled over Belle-Île, issued an order on the 12th of January, 1767, to take down in writing the sworn declaration of the heads of the Acadian families, in order to trace back their origin and filiation in France. Sixty-four declarations were thus registered, some of which relating to more than one family.

Here follows the declaration of l'Abbé LeLoutre, late Vicar-General of the diocese of Quebec, in Canada, given on the 1st March, 1767 :

"The Acadians, settled on this Island, were transported by the English from Acadia to Boston and other English colonies during the month of October, 1755. They were afterwards sent to Old England and dispersed in various parts of the Kingdom, during 1756. After 1763, when the treaty of peace had been concluded, they were taken to France on the King's vessels, and landed at various seaports; in 1765, during the month of October, they came to settle on this Island by order of Monseigneur le Duc de Choiseul, the Minister of Marine."

See narratives by l'abbé H. R. Casgrain and M. E. Rameau in "Le Canada Français," octobre, 1889, p. 165, et janvier, 1890, p. 26, des Documents sur l'Acadie."

NOTE.—For further details respecting Acadia, etc., see Part VI.

UNITED EMPIRE LOYALISTS
SETTLERS AND RECIPIENTS OF GRANTS OF LAND,
IN THE
PROVINCE OF QUEBEC
AND IN THE
MARITIME PROVINCES.

UNITED EMPIRE LOYALISTS.

The Independence of the United States, which had been recognized by France under Louis XVI, in 1778, was recognized by Great Britain, and peace was re-established between the latter and the revolted colonies, according to the Treaty of Versailles, 3rd September, 1783.

Those who remained faithful to the British Crown were named the United Empire Loyalists, and were rewarded for their loyalty.

Upwards of 40,000 of them came to settle in Canada and the Maritime Provinces. They were distributed approximately as follows :—

10,000 in the present Province of Quebec.

15,000 in the Province of Nova Scotia.

5,000 in the Province of New Brunswick.

10,000 in the present Province of Ontario (chiefly along the St. Lawrence from Lake St. Francis up to Detroit).

In the Provinces of Quebec and Nova Scotia the Loyalists received from 200 to 1,200 acres per family, together with agricultural implements, and were supplied with food and clothing by the Government during two years.

On 9th November, 1789, an Order in Council of the Government of the Province of Quebec was passed, providing for the settlement of the children of the Loyalists, attaining full age, a grant of 200 acres more or less to each.

In Ontario they were also provided with lands and assisted by the Government of the Province of Quebec, in virtue of the same Order in Council.

Quebec and Ontario were under one Government, until Ontario became a separate Province, under the name of Upper Canada in 1792, the remainder of the Province being called Lower Canada.

DISTANCES.

MARITIME PROVINCES.

Names of Places.		Miles.
Saint John to.....	Fredericton, west side of the river	65
do	do east side.....	86
do	do by steamboat.....	80
do	St. Andrews.....	65
do	Eastport, by steamboat.....	60
do	Portland do	230
Eastport to	Boston do	386
Saint John to	do by land and water.....	396
do	Washington, by land and water.....	834
do	Annapolis, by steamboat.....	45
do	Amherst do	165
do	do by land	138
do	Truro do	200
do	do by water	175
do	Halifax do	310
do	do by land	260
do	do mixed line, <i>via</i> Annapolis.....	173
do	Bend, by land.....	94
do	do by steamboat.....	120
do	Martin's Head, by land	48
do	Shepody.....	79
do	Sackville.....	127
do	Shediac.....	169
Shediac to	Richibucto.....	34
do	do by water	38
do	Chatham (Miramichi) by land.....	74
do	do do by water	80
do	Bathurst (Baie des Chaleurs) by land.....	122
do	Dalhousie, by land.....	175
do	do by water	220
do	Bedeque, P. E. Island, by steamboat.....	40
do	Charlottetown, P. E. Island, by steamboat.....	75
do	Cape Ray, Newfoundland.....	360
Bay Verte to.....	Charlottetown, by packet.....	51
Cape Tormentine to	Cape Traverse	9
Halifax to	Boston, by steam packet.....	428
do	Portland.....	380
do	Eastport or St. Andrews.....	280
do	Cape Canso. . . "Canseau."	150
do	Charlottetown.....	285
do	Pictou.....	260
do	Bay Verte	325
do	Shediac.....	340
do	Pictou, by land.....	164
Fredericton to	Woodstock.....	62
do	Grand Falls.....	135
do	Quebec.....	357
do	Chatham (Miramichi).....	109
do	St. Andrews, <i>via</i> Harvey Settlement.....	70

PART IV.

LATITUDES, LONGITUDES, CLIMATE, ETC.

AS OBSERVED DURING VARIOUS ARCTIC EXPEDITIONS AND OTHERWISE
AND ALSO THE
INTERNATIONAL CIRCUMPOLAR STATIONS.

COMPARATIVE

LATITUDES, LONGITUDES, VARIATION OF COMPASS.
DECLINATION AND DIP OF NEEDLE.
TEMPERATURE—RAIN AND SNOW FALL.
THICKNESS OF SALT AND FRESH WATER ICE.
DAYS OF CLOUDY WEATHER,
HOURS OF SUNLIGHT

At the principal places from Newfoundland to the Pacific and
Arctic Oceans.

OBSERVATIONS.

SIR ALEX. MACKENZIE'S EXPEDITIONS.

1st.—Left Fort Chipewyan, 3rd June, 1789.

Returned to Fort Chipewyan, 27th September, 1789.

2nd.—Left Fort de la Fourche, on Peace River, May, 1793.

Returned to Fort de la Fourche, on Peace River, 24th Aug., 1793.

MACKENZIE'S FIRST VOYAGE.

DOWN THE RIVER MACKENZIE, TO THE ARCTIC OCEAN, 1789.

Sir Alexander Mackenzie, the celebrated explorer, was born in Inverness, Scotland, about 1755. He came to Canada when young, and was employed as a clerk in the North-West Fur Company.

Having a desire to explore the then great unknown North-West, he returned to Britain and spent a year in the study of astronomy and navigation. He returned to Fort Chipewyan (Lake of the Hills), now Lake Athabasca, in 1789. Mackenzie had spent nine years at this Fort before then, trading with the Indians. On the 3rd of June, 1789, he set out from Fort Chipewyan with a party of twelve persons and four birch bark canoes on his first expedition.

On Friday, the 5th of June, he entered a river at the western end of Great Slave Lake, to which he gave his name. He explored this river to the Arctic Ocean, which he reached on the 12th of July. He reached 69° north latitude, when his progress was stopped by ice. He arrived at Fort Chipewyan, on the return journey, on the 27th September.

MACKENZIE'S SECOND VOYAGE.

ACROSS THE ROCKY MOUNTAINS, TO THE PACIFIC OCEAN, 1793.

On October 1792, MacKenzie undertook a more daring and hazardous expedition to the west coast of North America. He left Fort Chipewyan on the 10th of October, 1792, with ten men and one large canoe, ascended Peace River and reached Fort de la Fourche near the Deer Mountain, Lat. 56° 9' West, Long. 117° 35' 15" West, where he wintered.

He left there in May, 1793, continuing his journey up the Peace River, through the Rocky Mountains and along the Parsnip River, thence westward to the Salmon River and the Pacific Ocean.

He reached the Pacific after a series of attacks from most of the Indian tribes encamped along the various streams along his route. His return to Fort de la Fourche, which he reached 24th August, 1793, was nearly perilous to his life, and that of the few Indians who accompanied him.

He returned to his headquarters at Chipewyan and resumed his duties as chief trader. Of all the explorers of the North-West regions of Canada Mackenzie was the most daring and the most exposed to war weapons of Indians.

3rd.-

OBSERVATIONS.

FRANKLIN'S EXPEDITIONS, ETC.

1st.—1819, 1820, 1821, 1822.

Hudson Bay to Copper-Mine River and Polar Sea.

2nd.—1825, 1826, 1827.

New York to Fort William, thence *viâ* Lake Winnipeg, Cumberland House and chain of Lakes to the River Mackenzie, thence down to the Polar Sea, and along its east and west coasts.

3rd.—1845, 1846, 1847.

Viâ Davis Strait, Baffin Sea, Lancaster Sound, Beechey Island, Wellington Channel up to head of Grinnell Land, latitude 77 degrees north ; thence down channel along east side of Bathurst Island and west side of Cornwallis Island ; thence down Peel Sound to Boothia Felix and King William's Island, in search of a passage to Behring Sea and the Pacific Ocean, with two ships—"Erebus" and "Terror."

A-1.

FRANKLIN'S FIRST EXPEDITION.

Via Hudson Strait and Bay to York Factory, thence Overland by chain of rivers and lakes, to Athabasca Lake, Great Slave Lake, Yellow Knife and Copper-Mine Rivers, thence on the Polar Sea, Eastward, and return.

1819-1820-1821-1822.

Dates.	Localities.	Tempera- ture Fahrenheit varied	Latitu- des North.	Lon- gitudes West.	Distance- travelled, Statute Miles.
1819	<i>Journey Outward to the Polar Sea.</i>	From To	" " " "	" " " "	
May 23.	Franklin and party leave Gravesend, Eng., on board "Prince of Wales" ship of H's. B. C.				
Aug. 30.	York Factory reached. Remained there until 9th Sept.		57 0 3	92 26 0	3,458
Oct. 6.	Norway House, N.E. end of Lake Winnipeg		58 41 38	98 1 24	
do 22.	Cumberland H., Pine Lake, N. side of North River Saskatchewan		53 56 49	102 16 41	600
Nov. 6.	Pine Lake frozen over.				
1820					
Jan. 18.	Left Cumberland with sledges and snow shoes.				
do 19.		-40			
Mar. 26.	Reached Fort Chipewyan, N. side and West end of Athabasca Lake, near Outlet into Mackenzie River. Remained there about 3½ months.		58 42 38	111 18 20	857
July 18.	Departure with 16 men and 3 canoes.				
do 29.	Old Fort Providence, the Northernmost trading post of the North West Company, 22 miles up North Arm and North side of Great Slave Lake. This Fort 76 M. East of Moose-Deer Island Fort.		62 17 19	114 9 28	326
Aug. 2.	Departure with 6 officers, 17 voyageurs and 3 interpreters and 3 Indian wives with 3 children, 3 large and 2 small canoes.				
do 20.	Fort Enterprise via Yellow Knife River which ascends North Eastward, 156½ miles. This building, 50 x 24 feet, erected by Franklin. Party compelled to remain there 9 months for provisions. Indians and others refuse to proceed at this season.	+31 +42	64 30	112 30	217
1821					
June 7.	Dr. Richardson and portion of party start for the Copper Mine River and the Polar Sea	+73			
do 14.	Franklin and remainder of party follow.				
July 18.	Arrived at mouth of Copper-Mine River, Polar Sea. Discharged 4 men.		67 47 50	115 49 33	450
do 21.	Commenced voyage Eastward along coast of Arctic Ocean, 20 persons in all.	+43 +45			
do 23.	Port Epworth, reached.		67 42 15	112 30 0	
do 27.	Detention Harbour, reached.		67 53 45	110 41 20	
Aug. 18.	End of voyage Eastward, at Cape Turnagain, on Polar Sea, beyond Melville Sound and South of Dease Strait. Coast followed 355 G. M. from mouth of Copper-Mine River.	+38	68 18 50	109 25 0	638
Total distance travelled on Outward Journey to Polar Sea, and Eastward along Sea Coast					6,63

NOTE.—During the Return Journey, one of the party was lost, four died of exhaustion and starvation and five killed.

A-2.

FRANKLIN'S FIRST EXPEDITION—Continued.

1819-1820-1821-1822.

Dates.	Localities.	Temperature Fahrenheit.	Latitudes North.	Longitudes West.	Distance travelled. Statute Miles.
	<i>Return Journey From Cape Turnagain on the Polar Sea To Fort Enterprise.</i>	From To	° ' "	° ' "	
1821					
Aug. 22	Sent a tin case sealed adrift with account of journey, hoping it might drift Eastward. Commenced return journey from Cape Turnagain.		68 18 50	109 25	
do 25	Went to bed dinnerless and supperless. Sea voyage terminated. Mosquitoes disappear.	+42 +43 +48			
do 26	Commenced ascent of Hood River. Variation 41° 43' 22" E. Dip of needle, 88° 58' 48"		67 19 23	109 44 30	
do 31	Built 2 small canoes	+34 +36			
Sept. 10	Compass, etc., abandoned. Too weak to carry it.				
do 19	Canoe broken. Snow 2 feet deep.	+25 +30			
do 21	Richardson abandons specimens.				
do 25	Killed 5 deer, after feeding 8 days on Tripe de Roche, a sort of moss. Crédit returns without Junius who never returned.		65	112 20	
do 30	Encamped about 70 miles North of Fort Enterprise.				
Oct. 6	Ate old shoes and scraps of leather. Crédit and Vaillant unable to go further.				
do 7	Franklin continues journey.				
do 9	Richardson, Hepburn and Hood unable to travel. Michel, the Iroquois voyageur, suspected of shooting J. Bte. Belanger, Fontana and Perrault after leaving Franklin.				
do 11	Michel gives human flesh to eat, saying it was wolf.				
do 20	Michel shoots Hood at door of tent when alone.				
do 23	Richardson, Hepburn and Michel resume journey. Richardson shoots Michel, for self protection.				
do 29	They arrive at Fort Enterprise, where Franklin had arrived on the 10th, had left on the 20th and returned on the 21st. One partridge killed, divided into 6 parts; first flesh for 31 days, says Franklin.		64	112 30	
Nov. 1	Peltier dies of hardship and starvation.				
do 2	Samandré dies of hardship and starvation.				
do 7	Relief received, sent by Back, up to which time party lived on pounded bones of dead deer and Tripe de Roche.				
do 16	Franklin and party leave Fort Enterprise with Relief Indians.				
do 26	Arrive at Akaitcho's camp; remain there five days.		62 17 19	114 9 28	
Dec. 11	Arrive at Fort Providence; remain there four days.				
do 17	Arrive at Moose-Dee Island; remain there until 26th May, 1822.		61 11	8 113 51 37	
1822					
June 2	Arrive at Fort Chipewyan; remain there three days.		58 42 38	111 18 20	
July 4	Arrive at Norway House, Foot of Lake Winnipeg.		53 41 38	98 1 24	
do 14	Arrive at York Factory, Hudson's Bay, thence to England.		57 0 3	92 28 0	
Total distance travelled Overland and on the Polar Sea, —per Franklin.					5,550

B-1.

FRANKLIN'S SECOND EXPEDITION.

1825-1826-1827.

Route Travelled and partly Surveyed.	Statute Miles.
<i>During the Summer of 1825.</i>	
New York to Penetanguishene, <i>via</i> Albany, Niagara Falls, Toronto, Lake Simcoe to Ken- feldt Bay, Lake Huron, 15th March to 23rd April	760
Lake Huron. Penetanguishene to Saut-Ste-Marie, 23rd April to 1st May	250
Lake Superior. Saut-Ste-Marie to Fort William, 1st May to 10th May	406
Fort William, <i>via</i> Rainy Lake, Lake of the Woods, Lake Winnipeg and the North Saskatchewan River to Cumberland House, 10th May to 15th June	1,018
Cumberland House, <i>via</i> chain of lakes to Fort Chipewyan at junction of Lake Athabasca and Slave River, 16th June to 15th July	840
Fort Chipewyan to Fort Resolution at junction of Slave River outlet and Great Slave Lake, 25th to 29th July	240
Fort Resolution to New Fort Providence, at foot of Great Slave Lake and above its outlet into the Great Mackenzie River, 31st July to 2nd August	135
New Fort Providence, (where Mgr. Clut resides, 1889) down the Mackenzie River to Fort Simpson, 2nd to 4th August. Mgr. Clut intends to establish his Headquarters at Fort Chip- ewyan, near lower or west end and on north side of Lake Athabasca in 1890.	103
Fort Simpson to junction of Bear Lake River, 5th to 8th August	271
Bear Lake River to, and the return from Garry Island at the mouth of the Mackenzie in August, 1825. This was Franklin's 1st journey down the Mackenzie. He again descended in June, 1826	1,206
Length of the Bear Lake River to Fort Franklin near outlet of South-West Arm of Great Bear Lake, 8th August to 5th September	91
Dr. Richardson's excursion to the North-East termination or upper end of Great Bear Lake, near Fort Confidence, 4th July to 1st September	483
Distance travelled, as estimated by Franklin	5,803
Number of miles surveyed, as estimated by Franklin	2,593

Fort Simpson, near junction of the Rivers Liard and Mackenzie, below Great Slave Lake.

Lat. 62° 11' 0" N.—Long. 121° 38' W. per Franklin.

Old Fort Norman, towards outlet of Bear River from Great Bear Lake.

Lat. 64° 40' 38" N.—Long. 124° 44' 47" W.—Var. 39° 57' 52" E. per Franklin.

Fort Franklin, near outlet of Great Bear Lake into Bear River.

Lat. 65° 11' 56" N.—Long. 123° 12' 44" W.—Var. 39° 9' 0" E. per Franklin.

Old Fort Good Hope, on the Mackenzie.—Last Trading Post, 312 miles below Fort Norman.

Lat. 67° 28' 21" N.—Long. 130° 54' 38" W.—Var. 47° 28' 41" E.

See Part VII for further particulars respecting the "*Mackenzie River and Region.*"

B-2.

FRANKLIN'S SECOND EXPEDITION.

1825-1826-1827.

Dates.	Route.	Temperature Fah.			Statute Miles.
		From	To	Mean	
1826	<i>Fort Franklin to the Polar Sea.</i>				
Jan. 1....	Fort Franklin. Temperature observed during the month.	-16.2	-31.3	-23.8	0
June 24....	Left Fort Franklin for Polar Sea.				
July 1 to 7..	Old Fort Hope to west mouth of Mackenzie.	+41.6	+55.8		654
	<i>Voyage under Franklin on Polar Sea, West of the River Mackenzie,— With the Lion and Reliance Boats, 8 men each.</i>				
July 8 to 16.	Mouth of Mackenzie to Herschel Island	+47.3	+53.3		
do 17 to 31.	Herschel Island to Icy Reef	+39.3	+58.5		
Aug. 1 to 17.	Icy Reef to Return Reef near Point Beechey, Lat. 70° 26', Long. 148° 32'	+38.1	+44.6		374
do 18 to 31.	Icy Reef to the Mackenzie.—Returning.	+35.7	+45.6		374
Sept. 1 to 21.	Mouth of Mackenzie to Fort Franklin.	+31.1	+45.8		674
	Total going and returning.				2,076
1826	<i>Voyage under Dr. Richardson on the Polar Sea, —East of the Mackenzie,— With the Dolphin and Union Boats, 6 men each.</i>				Nautical Miles.
July 8 to					
Aug. 8....	East mouth of Mackenzie or from Point Encounter to mouth of the Copper-Mine River, Eastward.	+32	-26	+46.68	863
Aug. 9 to 18.	Mouth of Copper-Mine River, overland to Fort Confidence at North East or upper end of Great Bear Lake.				115
Aug. 18 to					
Sept. 1....	Fort Confidence to Fort Franklin at lower or west end and outlet of Great Bear Lake, by boat and canoe, (175 miles in a direct line)				318
	Reached Fort Franklin, after an absence of 71 days.				
	Total, 1,296 Nautical M. = 1,490 Statute M.				1,296
N.B.—	The N. E. entrance of the Mackenzie River to Great Slave Lake, by Franklin's Survey in 1825, is 1,045 Statute Miles.				

C.

FRANKLIN'S THIRD EXPEDITION

1845-1846-1847.

Via Davis Strait, Baffin Sea, Lancaster Sound, Beechey Island, Wellington Channel up to head of Grinnell Land, Latitude 77 degrees North; thence down channel along east side of Bathurst Island and west side of Cornwallis Island; thence down Peel Sound to Boothia Felix and King William's Island, in search of a passage to Behring Sea and Pacific Ocean, with two ships "Erebus" and "Terror."

Franklin never returned from this Expedition. He perished with his entire party, before any of the Expeditions sent for their relief could reach them.

First traces found were inscriptions upon three tombstones at Beechey Island, discovered in August, 1850, by Captain Ommaney, R. N., of H.M.S. "Assistance" and by Captain Penny of the "Lady Franklin."

In October, 1854, Dr. Rae ascertained from the Esquimaux of Boothia Felix that a party of about forty white men were met on the west coast of King William's Island, on their journey to the Great Fish River, where they all perished of starvation towards the spring of 1850.

Captain McClintock, R.N., LL.D., during his voyage on the small steam vessel "Fox," of 170 tons, 30th June, 1857, to 21st September, 1859, ascertained the only authentic intelligence of the death of Sir John Franklin and of the fate of the crews of the "Erebus" and "Terror."

From a record found in a cairn near the head of King William's Island, in May, 1859, by Lieut. W. R. Hobson, under McClintock, it appears that the latter died 11th June, 1847, at which time the total loss by deaths had been 9 officers and 15 men, out of a party of 105 who had landed there 22nd April, 1847, their vessels having been beset by ice since 12th September, 1846.

This document was dated 25th April, 1848, and signed by Captain F. R. M. Crozier, of the "Terror," and Captain James Fitzjames of the "Erebus." They added a note stating that they would start next day for Back's Fish River.

For details see Captain McClintock's narrative respecting Franklin's discoveries and his own, published in London, 1859.

See also List of the various Expeditions sent for the relief of Sir John Franklin, 1848 to 1859 inclusive, at end of Part IX.

D-1.

FRANKLIN'S FIRST EXPEDITION.

Temperature of Region—Fort Enterprise to the Polar Sea.

From Latitude 64° to 68° and Longitude 109° to 116°.

1819-20-21-22.

Dates.	Localities.	Thermometer Fahrenheit.		Mean Temperature.	Variation of Compass East.
		Varied.			
		From	To		
<i>Fort Enterprise. Log House 50 x 24 where Franklin spent several months.</i>					
1820					
August 24.	At tent of Encampment.	+ 31	+ 42		
September.	Building commenced on the 4th, near Lat. 64° Long. 112½.	+ 16	+ 53	+ 33½	
October.	Removed from Tents to House on 6th.	+ 37	- 5	+ 23	
November.	At Fort Enterprise.	+ 25	- 31	+ 7	
December.	do do	+ 6	57	29.7	
1821					
January	do do	+ 20	- 49	- 15.6	
February	do do	+ 1	- 51	- 25.3	
March	do do	+ 20	- 49	- 11.5	
April	do do	+ 40	- 32	+ 4.6	
May	do do	+ 68	+ 8	+ 32.0	
June 7	Dr. Richardson starts in advance of Franklin who joined him on 21st.	+ 73			
do 21	Copper Mine River. Point Lake.				
do 23	Lat. 65° 12' 14". Long. 113° 8' 25".—55 miles below Fort Enterprise.	+ 39			
	Ice 6 to 7 feet thick along channel.				45 4
July 10	Portage leading to Great Bear Lake. Lat. 67° 1' 10". Long. 116° 27' 28".				44 11 43
	Dip of needle 87° 31' 18".				
do 21	Polar Sea. Lat. 67° 47' 50".	+ 43	+ 45		
do 27	Detention Harbour on Polar Sea. Lat. 67° 53' 45". Long. 110° 41' 20".				40 49 34

D—2.

FRANKLIN'S SECOND EXPEDITION.

1825-26-27.

Temperature at Fort Franklin, as observed by Mr. Dease of the Franklin Expedition, from Sept., 1825, to Sept., 1826:—In Latitude $65^{\circ} 11' 56''$ North, and Longitude $123^{\circ} 12' 44''$ West.—At lower or S. W. end of Great Bear Lake, towards its outlet.

Months.	Temperature.		
	Highest.	Lowest.	Mean.
September.....	+48.12	+38.08	+42.92
October.....	+24.80	+14.18	+20.28
November.....	+ 8.39	+ 3.72	+ 2.79
December.....	+ 8.18	-21.63	-13.96
January.....	-16.17	-31.25	-23.78
February.....	+ 4.95	-21.71	12.70
March.....	+ 3.87	-22.01	- 8.26
April.....	+24.83	+ 3.99	+15.21
May.....	+43.89	+24.47	+36.35
*June.....			+48.00
July.....	+60.24	+42.64	+52.10
August	+58.21	+42.98	+51.09

*Record for month of June was stolen by Esquimaux, mean temperature given cannot be more than one or two degrees astray.

E-1.

Mean Temperature during the Summer and Winter months.

At various Polar Stations.

Years.	Stations.	Latitude North.	Longitude West.	Temperature June, July, August.	Temperature December, January, February.	Remarks.
		" " "	" " "	Above Zero.	Below Zero.	
May 13, 1882	Lockwood Island.....	83 24 0	40 46 0	14.0 May.	No record.	Extreme North reached by Lieut. Lockwood of the Greely Expedition. — N. W. coast of Greenland on the Polar Sea.
1881 1883	Grinnell Land, Lady Franklin's Bay; Fort Conger.....	81 44 0	64 45 0	34.4	38.9	W. side—Hall Basin to Robeson Channel. Var. 110° 12' W.
1881 1883	Dijmphna (Sea of Kara) S. side of Nova Zembla....	70 10 0	64 0 0	34.0	8.6	S. side of Nova Zembla, Russia.
1819 1820	Melville Island.....	74 47 0	111 0 0	37.1	7.4	Melville Sound.
1821 1822	Winter Island (Parry).....	66 11 0	83 0 0	35.0	28.0	Fox Channel, Hudson's Bay.
1822 1823	Igloodik (Parry).....	69 21 0	82 0 0	34.4	21.3	do do
1824 1825	Port Bowen.....	73 13 0	80 0 0	37.0	25.1	Baffin Sea, Eclipse Sound.
1829 1832	Boothia Felix.....	69 59 0	92 0 0	38.0	27.7	Esquimaux Settlers, Gulf of Boothia.
1846 1854	Repulse Bay—Fort Hope....	66 32 0	87 0 0	35.7	23.3	N. of Rowe's Welcome, Hudson's Bay.
1848 1849	Port Leopold.....	73 50 0	90 15 0	34.0	31.7	Regent Inlet.
1848 1849	Point Providence.....	64 14 0	165 0 0	37.3	20.5 Jan.	Behring Sea.
1849 1850	Chloris Peninsula.....	66 58 0	173 0 0	45.0 Aug.	12.0 Jan.	E. Siberia.
1849 1850	North Star Bay.....	76 34 0	69 0 0	37.7	25.7	N. E. end Baffin Sea, Greenland.
1849 1851	Fort Simpson*.....	62 7 0	122 0 0	62.9 June.	14.7	R. Mackenzie.
1848 1851	Fort Confidence.....	66 40 0	119 0 0	43.7 do	29.0	N. E. part of Great Bear Lake.
1850 1852	Point Clarence.....	60 45 0	165 0 0	45.0	7.6	Behring Sea.
1850 1851	Griffith Island.....	74 34 0	95 30 0	34.5	28.8	Peel Sound.
1850 1853	Prince of Wales Strait.....	72 47 0	118 0 0	36.7	31.2	Beaufort Sea and Melville Sound.
1850 1853	Bay of Mercy.....	74 6 0	118 0 0	36.7	31.2	do
1851 1852	Walker Bay.....	71 35 0	118 0 0	37.0	17.0	McClure Strait.
1852 1853	Cambridge Bay.....	69 3 0	105 0 0	36.9	31.8	N. side Dease Strait.
1853 1854	Camden Bay.....	70 8 0	145 0 0	37.7 June.	21.5	Polar Sea Coast—W. of R. Mackenzie.
1851 1852	Batty Bay.....	73 12 0	91 0 0	24.1 Sept.	18.5	E. side Somerset Island.
1852 1854	Beechey Island.....	74 5 0	92 0 0	39.4 July.	28.3	Franklin wintered 1845-46.
1852 1853	Northumberland Sound....	74 31 0	97 0 0	34.3	32.3	W. of Barrow Strait.
1853 1854	Wellington Channel.....	75 31 0	92 0 0	35.1	14.2	Franklin ascended.
1853 1855	VanRensselaer Harbour....	78 37 0	70 53 0	33.0	29.6	W. Coast of Greenland.
1858 1859	Port Kennedy.....	72 01 0	94 0 0	40.1 July.	35.3	Bellot Strait—The "Fox" wintered here.
1860 1861	Foulke.....	78 18 0	73 0 0	36.8	21.2	Smith Sound.
1869 1870	Sabine Island.....	74 32 0	19 0 0	33.2 Aug.	10.0	E. Coast Greenland.
1871 1872	Thank-God Harbour.....	81 35 0	61 44 0	37.7	30.5	Robeson Channel.
1872 1873	Polaris House.....	78 18 0	72 51 0	No Record	21.2	
1875 1876	Discovery Harbour.....	81 44 0	65 0 0	34.1	36.7	Robeson Channel.
1875 1876	Floeberg Beach.....	82 27 0	61 22 0	34.3	31.0	Lincoln or Polar Sea.
1872 1874	Franz Josef Land.....	79 51 0	59 0 0	32.9	20.5	Between Greenland and Nova Zembla.
1882 1883	Fort Rae.....	62 39 0	115 44 0	55.5 July.	17.6	Head N. arm of Great Slave Lake.

* Capt. Lefroy, 1842-44, gives Lat. 61° 52' N., and Long. 121° 25' 2" W. at Fort Simpson.

E-2.

Comparison of Climate at Polar stations on the West Coast of Greenland, with that of other Polar stations in Russia and in Canada.

Stations.	Latitude.	Summer Temperature June, July, August.	Winter Temperature December, January, February.	Range of Temperature.
<i>1. Siberian and Russian North American Stations.</i>				
Yakoutsck, Siberia	62 2	+58.3	-36.6	94.9
Yukon, Alaska	66 0	+59.7	-23.9	83.6
<i>2. Stations on the West Coast of Greenland.</i>				
Rennselaer Harbour	78 37	+33.0	-29.6	62.6
Westenholm	76 35	+38.0	-28.7	66.7
Upernavik	72 48	+35.2	-12.5	47.7
Omenak	70 41	+40.7	-5.1	45.8
Jacobshavn	69 12	+42.4	+0.8	41.6
<i>3. Stations West of Baffin's Bay.</i>				
Melville Island	74 47	+37.1	-28.2	65.3
Assistance Bay	74 40	+35.9	-26.7	62.6
Port Bowen	73 14	+37.0	-25.1	62.1
Boothia Felix	69 59	+38.0	-27.7	65.7
Igloodik	69 21	+35.2	-21.3	56.5
Old Fort Good Hope. River Mackenzie	67 28	+39.7	-25.1	64.8
Winterinsel	66 11	+35.1	-20.5	55.6
Fort Franklin, at W. end of Great Bear Lake ..	65 12	+50.2	-17.0	67.2
Mean				62.3

The above is according to Charles A. Schott of the United States Coast Survey

F

FRANKLIN'S FIRST EXPEDITION.

1819-1820-1821-1822.

Variation of Compass and Dip of Needle observed by Franklin.

Dates.	Localities.	Variation of Compass East.	Dip of Needle.
<i>First Expedition, Between Winnipeg and the Polar Sea, via Copper-Mine River, and thence on the Polar Sea.</i>			
1819			
Oct 4	Norway House. Foot of Lake Winnipeg.	14 12 41	83 40 10
5 22	Cumberland H. North Saskatchewan	17 17 29	83 12 50
1820			
Feb 23	De la Croix.	22 15 48	84 13 35
Mar 6 7	Beaver River. W. side of Clear Lake.	22 33 22	
5 19	Methye Lake. Trading Post.	22 50 28	
6 26	Fort Chipewyan. West end. Outlet L. Athabasca.	22 49 32	
July 28	De la Cache. Great Slave Lake.	31 2 6	
5 29	Old Fort Providence. North Arm. Great Slave Lake.	33 35 55	86 38 2
Aug 15	Grizzly Bear Lake. South of Fort Enterprise.	36 50 47	87 20 35
1821			
July 23	Fort Epworth. Eastward of Copper-Mine River on Polar Sea.	44 37 42	
5 27	Detention Harbour. do do do	40 49 54	
Aug 18	Cape Turnagain. Extreme Point Eastward, on the Polar Sea, reached by Franklin.	44 15 46	89 31 12
6 26	Hood River Mouth on Polar Sea. Return voyage.	41 43 22	88 58 48

G

FRANKLIN'S SECOND EXPEDITION.

1825-1826-1827.

Observations for Latitude, Longitude and Variation—by Franklin, during his two journeys to the Polar Sea, 1825 and 1826.

Place of Observation.	Date.		Latitude North.	Longitude by Chronometer West.	Variation East.
	Month	Day			
1825					
Penetanguishene, Lake Huron.....	April.....	11	44 48 42	80 00 52	0 56 16
Fort William, Lake Superior.....	May.....	12	48 23 40	89 16 8	7 17 28
Rainy River, H. B. Co. Fort.....	do.....	23	48 36 18	93 28 33	10 42 33
Lake of the Woods.....	June.....	1	49 21 19	94 38 16	12 13 39
Cumberland House, N. R. Saskatchewan.....	do.....	22	53 57 33	102 21 46	19 14 21
Ile à la Crosse Fort.....	do.....	27	55 25 25	107 54 36	23 19 26
Fort Chipewyan, Outlet L. Athabasca.....	July.....	11	58 42 38	111 18 20	25 29 37
Fort Resolution, Junction Slave River and Great Slave Lake.....	do.....	30	61 10 26	113 45 00	22 19 9
Outlet G. Slave L. into R. Mackenzie.....	August.....	1	61 30 00	118 47 56	33 13 21
Old Fort Norman, R. Mackenzie.....	do.....	7	64 40 38	124 44 47	39 57 52
Old Fort Good Hope, R. Mackenzie.....	do.....	11	67 28 21	130 51 48	47 28 41
1826					
Leith Pt., G. Bear Lake.....	April.....	22	65 46 49	119 13 53	44 54 16
Fort Franklin, G. Bear Lake.....	June.....	7	65 11 56	123 12 44	39 9 0
Old Fort Norman on the R. Mackenzie.....	do.....	27	64 40 38	124 44 47	39 57 52
Old Fort Good Hope, Lowest Trading Post.....	July.....	1	67 28 21	130 51 38	47 28 41
Near West Outlet of R. Mackenzie.....	do.....	7	68 52 05	136 18 15	
<i>West of R. Mackenzie.</i>					
Barter Island.....	August.....	4	70 5 11	143 54 55	45 36 04
Foggy Island.....	do.....	8	70 16 27	147 38 04	43 15 12
Return Reef.....	do.....	17	70 25 53	148 52 00	41 20 00
<i>East of R. Mackenzie.</i>					
Cape Bathurst.....	July.....	18	70 30 46	127 30 0	
Cape Lyon.....	do.....	25	69 46 25	122 50 55	
Point Clifton.....	August.....	1	69 13 15		
Cape Sir W. Hope.....	do.....	4	68 58 23		52 30 00
Cape Kendall.....	do.....	8	67 58 26	115 18 00	
Mouth of Copper-Mine River.....	do.....	8	67 47 50	115 36 49	48 00 00

N. B.—The longitude of Fort William was determined by the Boundary Line Commissioners, after Franklin's departure for England, as being $89^{\circ} 22' 40''$.

New Fort Norman is about 23 miles below the ruins of the Old Fort which was on the West side of the Mackenzie.

H-1

HYETAL OR RAIN TABLE.

—DOMINION OF CANADA.—

Localities.	Precipitation Inches of Water.
On the westerly slope of the Cascade Mountain and Vancouver Island.	50
On eastern slope of Cascade Mountain	30
On westerly slope of Rocky Mountains	25
On eastern slope of Rocky Mountains	20
Snake River Valley	15
Between Red River and the Meridian of 100 degrees of West Longitude.	25
Eastward of Red River, including Lakes Superior, Michigan, Huron and Erie.	30
Between East of Hamilton, covering Lake Ontario, Provinces of Quebec, New Brunswick,	
Prince Edward Island and Nova Scotia	36
For 1849. Lat. 81 44. Long. 64 45. During Greely Expedition. 1881-82 1882-83	
34.6 to 3.82 inches, per year.	4

H-2.

QUARTERLY Average Number of Days of Rain in the Dominion of Canada and in Newfoundland, and the Number of Days of Snow in each Month during the Year 1886.

	Number of Days of Rain.					Number of Days of Snow.								
	Winter.	Spring.	Summer.	Autumn.	Year.	January.	February.	March.	April.	May.	October.	November.	December.	Year.
Ontario.....	13.3	22.9	25.5	15.8	77.5	11.3	9.0	6.6	2.4	8.	0.9	6.9	9.7	46.8
Quebec.....	9.5	28.6	35.9	14.8	88.8	11.6	8.9	9.4	2.8	1.4	1.9	9.5	11.3	56.8
New Brunswick.....	16.3	24.7	36.3	23.8	101.1	11.1	8.3	9.4	2.9	8.	0.4	4.3	9.8	46.2
Nova Scotia.....	21.8	24.9	33.2	26.9	106.8	6.0	8.8	7.6	2.6	.....	0.5	3.9	7.9	37.3
Prince Edward Island.....	23.5	38.5	49.0	39.0	150.0	9.5	11.0	13.0	5.5	.....	0.0	2.0	13.0	54.0
Manitoba.....	0.5	21.4	18.8	5.3	46.0	7.3	7.2	5.8	1.6	1.2	1.8	5.2	4.3	34.4
North-West Territory.....	1.0	14.7	15.0	2.9	33.6	5.5	5.3	4.7	0.7	1.4	2.6	4.7	5.4	30.3
British Columbia.....	23.7	20.5	19.8	38.0	102.0	5.8	2.0	2.0	0.0	1.3	1.2	1.4	4.4	18.1
Newfoundland.....	26.7	29.1	33.7	22.6	112.1	8.7	9.7	12.0	5.7	3.5	3.3	5.3	7.3	55.5

I

MAXIMUM Thickness of Salt Water Ice and of Fresh Water Ice.

Observed at various Polar Stations.

Stations.	Latitude North.	Date.	Thickness in Inches.	Remarks.
<i>Salt Water Ice.</i>				
1 Melville Island	74 47	May 17, 1859	50	N. side of Melville Sound.
2 Winter Island	66 11	March 7, 1852	55	N. side of Fox Channel, H. R.
3 Port Bowen	73 13	May 4, 1855	86 5	E. side of Regent Inlet.
4 " " of Boothia.	69 59	April 30, 1859	90	W. side of Boothia Felix.
5 " " of Boothia.	69 59	April 30, 1851	72	do " do
6 " " of Boothia.	69 59	March 31, 1852	84	do " do
7 Assistance Bay	74 40	May 10, 1851	91	Cornwallis Island.
8 Walker Bay	71 35	April 1, 1852	67 5	McClure Strait.
9 Jones Island	74 56	March 15, 1853	84	S. side Melville Island.
10 Lancaster Bay.	69 03	May 1, 1853	98	N. side Dense Strait.
11 Lancaster Bay.	70 08	June 1, 1854	86	Polar Sea Coast. West of R. Mackenzie.
12 Wellington Channel	75 31	March 24, 1854	66	Ascended by Franklin.
13 Bell Kennedy	72 01	April 11, 1859	74	Bellot Strait.
14 Sabine Island	74 32	May 21, 1879	79	E. Coast of Greenland.
15 Foxe's Bay.	82 27	May 4, 1876	79 2	Coast of Polar Sea. W. of Robinson Channel.
16 Discovery Harbour	81 44	April 30, 1876	39 2	Early Franklin Bay. W. side Hall Basin.
17 Discovery Harbour	81 44	May 21, 1882	59 8	do " do
18 Discovery Harbour	81 44	May 1, 1883	57 8	do " do
<i>Fresh Water Ice.</i>				
19 Lake Alexandra	81 40	March 9, 1882	80	Near Discovery Harbour.
20 Lake Alexandra	81 40	May 21, 1883	67	do " do
21 Igrook	69 21	June, 1823	69 84	W. side of Fox Channel.

J

CLIMATICAL situation and Climate of various localities in Canada and Newfoundland, from 42 to 82 degrees of North Latitude, and from 52 to 125 degrees of West Longitude.

Localities.	Elevation above the Sea.	Latitudes North.	Temperature, Fahrenheit.				Longitudes West.	Rain-fall.				Snow-fall in inch.	Rain-fall in inch.	Snow-fall in inch.	Percentage of Cloud.
			Summer Mean.	Winter Mean.	Highest.	Lowest.	Mean for the Year.	Number of Days.	Number of Days.	Number of Days.	Number of Days.				
	Feet.		Above zero.	Above or Below zero.	Above zero.	Below zero.	Mean for the Year.	Rain-fall.	Rain-fall.	Rain-fall.	Rain-fall.				
1 Antwerp, S. W. Point, P. E.	20	49 23 45	63 35 46	53 97	+ 18 23	13 9	36 03	58	40	23 07	67 2	53			
2 Antwerp, West Point, do	126	49 52 12	64 32 03	54 67	+ 16 63	72 0	35 66	66	47	33 01	70	70			
3 Belle Ile, Lighthouse, do	3,380	51 0 0	55 22 15	46 17	+ 11 23	62 0	21 0	31 57	46	72	33 01	70			
4 Calgary, Alberta District.	3,380	51 0 0	114 0 0	37 90	+ 17 10	94 0	39 7	38 04	31	31	7 28	10 4	34		
5 Charlotteown, P. E. I.	38	46 13 53	63 7 23	21 57	92 0	15 0	40 17	138	47	32 13	96 0	62			
6 Charlottetown, do	990	46 46 0	64 3 0	60 37	+ 18 07	84 4	18 4	33 51	26	4 53	26 9				
7 Cumberland House, Saskatchewan District.	990	53 37 33	102 21 46	62 64	+ 3 73	93 0	57 0	31 79	15						
8 Edmonton, Alberta District	2,253	53 38 0	113 39 0	37 29	+ 8 33	88 0	43 0	13							
9 Fort Chipewyan, Athabasca Lake.	124	58 8 0	68 16 0	36 60	....	....	43 0	13							
10 Fort Chipewyan, Athabasca Lake.	124	58 42 38	111 18 29	53 97	+ 13 57	83 3	49 0	24 41	52	67	6 74	78 4	54		
11 Fort Chipewyan, Athabasca Lake.	124	81 41 0	64 45 0	34 40	- 38 90	74 0	62 2	17 00							
12 Fort Franklin, Great Bear Lake.	290	63 10 38	123 12 44	50 29	17 00	60 23	31 3	17 50							
13 Fort Norman, Old, Mackenzie River.	290	64 40 38	124 14 47	50 29	17 00	60 23	31 3	17 50							
14 Fort Rae, Great Slave Lake.	391	62 29 0	115 44 0	53 53	- 17 60	85 00	52 60								
15 Fort Simpson, Mackenzie River.	241	62 7 0	122 0 0	53 37	- 14 70	69 30									
16 Fredericton, Province of New Brunswick.	164	46 3 0	66 38 15	61 90	+ 19 27	89 3	24 0	41 34	103	44	4 13	19 2			
17 Halifax, do Nova Scotia.	372	43 54 0	70 57 0	67 63	+ 26 89	84 0	8 0	41 38	153	60	25 88	125 5	50		
18 Hamilton, do Ontario.	397	43 54 0	76 38 30	64 90	+ 19 20	96 5	21 7	46 37	95	75	29 93	118 1	62		
19 Kingston, do Quebec.	187	45 30 22	73 33 14	63 93	+ 15 87	87 8	23 6	41 31	122	90	26 83	116 0	61		
20 Massé Factory, Hudson's Bay.	236	45 23 0	75 42 0	62 80	+ 13 17	89 1	26 5	40 47	103	83	21 60	115 4	60		
21 Ottawa, Province of Ontario.	641	46 24 30	64 46 0	38 27	+ 8 23	67 4	33 0	33 77	83	38	18 18	51 0			
22 Port Arthur, do	641	46 24 30	64 46 0	38 27	+ 8 23	67 4	33 0	33 77	83	38	18 18	51 0			
23 Port Burwell, Hudson's Strait	236	62 34 10	78 1 0	29 43	- 18 90	82 0	43 0	16 37	58	32	8 77	35 5			
24 Port Churchill, Hudson's Bay	236	62 34 10	78 1 0	29 43	- 18 90	82 0	43 0	16 37	58	32	8 77	35 5			
25 Port Laperrière, Entrance, Hudson's Bay	236	49 17 0	122 52 0	58 57	+ 49 10	85 0	+ 17 0	40 68	70	26 71	116 9	100			
26 Port Moody, Province of British Columbia	333	46 48 42	73 12 30	60 47	+ 15 17	85 5	- 27 9	38 81	23	14 0	65 12 5				
27 Quebec Citadel, Quebec.	333	50 19 0	104 4 0	61 67	+ 0 53	106 5	- 49 5	32 92	26	14 0	65 12 5				
28 Regina, Assiniboia District.	406	50 19 0	104 4 0	61 67	+ 0 53	106 5	- 49 5	32 92	26	14 0	65 12 5				
29 Sable Island, Atlantic Ocean, N.S.	43 66 24	60 2 50	68 71	32 67	73 0		10 0	46 07	105	19	31 52	12 5			

30	34	Johns, Province of New Brunswick	116	45 16 4"	66	3 4"	58 6 8	27 7 3	80 7	11 0	41 0	101	68	37 05	87 4	57
31	35	Johns, Newfoundland	47	43 1"	47 42 03	43 07	28 97	89 0	0	0	4 16	17 4	47	39 41	73 0	64
32	36	Johns, Cape Breton, N. S.	56	46 8 4"	64 12 30	60 47	25 37	84 0	14 0	17 30	137	45	39 01	67 6	60	
33	37	Fortu, Province of Ontario	350	43 38 29	79 28 35	64 23	27 83	69 5	27 8	43 02	112	66	27 72	73 5	61	
34	38	Three Rivers, Province of Quebec	40	49 43	72 52 18	64 53	26 00	91 0	24 0	44 50						
35	39	Antigonish, Nova Scotia	10	48 30 0	123 25 0	58 57	40 10	85 0	17 0	49 08	127	6	26 84	14 5		
36	40	Windsor, Province of Manitoba	764	49 52 0	97 08 0	60 87	2 0 17	103 0	44 6	53 58	85	70	12 57	22 7	49	
37	41	Windsor, Ontario	604	42 0 0	87 20 0	68 53	25 97	93 2	11 0	47 40	83	30	23 15	64 3	51	
38	42	Yarmouth, Nova Scotia	57	43 50 0	66 7 25	58 87	29 00	78 5	2 9	44 25	147	54	40 49	80 4	58	
39	43	York Factory, Hudson's Bay	55	57 0 3	92 28 0	58 17	17 19	98 5	45 3	20 53	44	56	25 10	70 1		

A. H. A. L.
 A. L.

N. B.

Summer Temperature, June, July, August. Winter Temperature, December, January, February.

The above is based chiefly on Campbell's Meteorological Tables for 1886, published in 1889.

The Latitude and Longitude are from Sir John Franklin's Admiralty Bay, Capt. Gordon, Lat. 64° 54' 3" Long. 125° 43' 1" per Ogilby, 1888.

New Fort Norman, 25 miles to the west of old Fort, and just above entrance of Great Bear Lake River. Lat. 64° 54' 3" Long. 125° 43' 1" per Ogilby, 1888.

Fort McPherson, Lat. about 67° 26' N. Long. 134° 57' W. (See W. Ogilby's Report to Dept. Int., 1888, 89.)

Fort Conitiam, Temperature, 20th May, 1840, by John Lee Lewis, then Trader, H. B. C., p. 53.

Fort Smith, The Latitude and Longitude given above were established 1840-51.

Capt. Lettice, 1847-49, gives Lat. 64° 52' N. Long. 124° 25' W.

Franklin, in 1825, gives Lat. 62° 11' N. Long. 121° 38' W.

K
RIVER YUKON AND MACKENZIE RIVER REGIONS.
 1887-1888.

MAGNETIC OBSERVATIONS.

Place.	Date.	Latitude.	Longitude.	Declination.	Dip.	Total Force.
Yukon Region:—						
	1887.					
Lake Lyndeman.....	June 25..	59 47.1	135 04.8	32 16.8	77 05.1	12 969
Marsh Lake.....	July 17..	60 21.1	134 17.2	32 46.1	77 32.5	13 076
Cañon.....	do 24..	60 42.3	135 04.1	30 55.2	77 43.9	12 884
Lewes River.....	Aug. 7..	62 04.5	136 04.0	33 54.8	78 16.4	13 068
Fort Selkirk.....	do 18..	62 47.6	137 24.9	34 17.0	79 08.6	13 049
White River.....	do 26..	63 11.9	139 37.8	34 27.9	78 19.4	12 950
Stewart River.....	do 27..	63 22.3	139 28.5	33 52.8	78 36.6	12 933
Forty-Mile River.....	Sept. 12..	64 25.5	140 31.7	35 01.1	78 46.2	12 885
1888.						
Boundary.....	Jan. 3..	64 41.0	140 54.0	Not read	78 49.9	13 002
do.....	Feb. 27..	64 41.0	140 54.0	35 45.3	78 49.4	13 012
do.....	do.....	64 41.0	140 54.0	35 47.5	78 49.4	13 018
Porcupine River.....	May 16..	65 43.0	139 40.0	37 44.3	79 57.3	13 053
do.....	do 20..	65 43.0	139 40.0	37 23.7	79 52.4	12 962
LaPierre's House.....	June 7..	67 23.0	Unknown.	Not read.	81 24.7	12 968
Mackenzie Region:—						
McPherson.....	do 22..	67 26.0	134 57.0	46 00.8	81 48.9	13 205
Good Hope.....	July 13..	66 16.0	140 54.0	41 30.9	82 18.4	13 264
Norman.....	do 29..	64 54.3	125 43.1	33 39.0	82 00.5	13 350
Mackenzie River.....	Aug. 5..	64 26.7	125 03.3	41 34.6	81 56.1	13 360
Simpson.....	do 27..	61 52.0	121 25.2	37 42.3	81 19.2	13 501
Resolution.....	Sept. 20..	61 10.5	113 46.5	38 19.9	82 09.1	13 680
Chipewyan.....	Nov. 22..	58 43.0	111 18.7	27 15.3	81 21.8	13 708
do.....	do 23..	58 43.0	111 18.7	27 09.5	81 22.5	13 720
do.....	do 24..	58 43.0	111 18.7	27 17.9	Not observed.	

L.

MACKENZIE River Region compared with Ottawa—Magnetic Observations.
HOURS OF SUNLIGHT.

—	Ottawa.	Chipewyan.	Simpson.	Good Hope.	McPherson.
Latitude.....	45° 26'	58° 43'	61° 52'	66° 18'	67° 26'
	H. M.	H. M.	H. M.	H. M.	H. M.
Hours sunlight May 1.....	14 08	15 34	16 05	17 06	17 30
do June 1.....	15 16	17 36	18 39	21 04	24 00
do do 21.....	15 30	18 44	19 14	22 48	24 00
do July 1.....	15 24	18 36	19 02	22 04	24 00
do Aug. 1.....	14 32	16 16	16 56	18 16	19 24
do do 31.....	13 08	13 52	14 08	14 36	14 44
	Hours.	Hours.	Hours.	Hours.	Hours.
Hours sunlight in May.....	456	514	538	592	706
do June.....	462	549	570	662	720
do July.....	464	530	558	625	684
do August.....	423	467	481	519	527
Totals ..	1,805	2,060	2,147	2,398	2,637

M

FRANKLIN'S SECOND EXPEDITION.

1825, 1826 and 1827.

MAGNETIC POLE.

The position of the Magnetic Pole, as computed from Franklin's observations, by Professor Barlow, is in $69^{\circ} 16'$ north latitude and $98^{\circ} 8'$ west longitude, and by the observations of Capt. Parry, in lat. $70^{\circ} 43'$ north, long. $98^{\circ} 54'$ west, its mean place being in lat. 70° north, long. $98^{\circ} 31'$ west, which is between Port Bowen and Fort Franklin, the former being situated in lat. $73^{\circ} 14'$ north, long. $88^{\circ} 54'$ west, and the latter in lat. $65^{\circ} 12'$ north, and long. $123^{\circ} 12'$ west.

N

INTERNATIONAL CIRCUMPOLAR STATIONS.

ESTABLISHED IN 1882-1883.

Government.	Station.	Latitude.	Longitude.	Chief.
Austria-Hungary.....	Jan Mayen.....	$70^{\circ} 59' N.$	$8^{\circ} 28' W.$	Lieut. Emil von-Wohlge-muth.
Denmark.....	Godthaab.....	$64^{\circ} 11' N.$	$51^{\circ} 41' W.$	Asst. A. F. W. Paulsen.
Finland.....	Sodankyla.....	$67^{\circ} 24' N.$	$26^{\circ} 36' E.$	Asst. E. Biese.
France.....	Orange Bay, Cape Horn.....	$53^{\circ} 31' S.$	$70^{\circ} 21' W.$	Lieut. Courcelle-Seneuil.
Germany.....	Kingawa Fiord, Cumberland Sound.....	$66^{\circ} 36' N.$	$67^{\circ} 14' W.$	Dr. W. Giese.
Germany.....	Royal Bay, S. Georgian Islands.....	$53^{\circ} 31' S.$	$36^{\circ} 5' W.$	Dr. C. Schrader.
Great Britain and Canada.....	Ft. Rae, Head N.E. Branch of Great Slave Lake.....	$62^{\circ} 39' N.$	$115^{\circ} 44' W.$	Capt. H. P. Dawson, R.A.
Holland.....	Dicksonhaven.....	$73^{\circ} 30' N.$	81°	E. Dr. M. Snellen.
Norway.....	Bossekop.....	$69^{\circ} 56' N.$	23°	E. Asst. A. S. Steen.
Russia.....	Lena Delta.....	73°	$124^{\circ} 40'$	E. Lieut. Jurgens.
Russia.....	Nova Zembla, Karmaluke Bay.....	$72^{\circ} 30' N.$	53°	E. Lieut. Andrejew.
Sweden.....	Spitzbergen.....	$78^{\circ} 28' N.$	$15^{\circ} 45'$	E. Candidate N. Ekholm.
United States.....	Point Barrow.....	$71^{\circ} 18' N.$	$156^{\circ} 24' W.$	Lieut. P. H. Ray, 8th Inf.
United States.....	Lady Franklin Bay.....	$81^{\circ} 44' N.$	$64^{\circ} 45' W.$	Lieut. A. W. Greely, 5th Cav.
Denmark.....	Kara Sea.....(About	$71^{\circ} 0' N.$	$64^{\circ} 0' E.$	Lieut. A. P. Havgard.
		*Estimated.		

PART V.

NATURAL RESOURCES.

PRODUCTS AND TRADE, &c.

IMPORTS OF COAL INTO THE DOMINION DURING 1885-86-87-88.

Provinces.	1885.	1886.	1887.	1888.
	Tons.	Tons.	Tons.	Tons.
Ontario.....	1,492,459	1,587,372	2,180,356	2,093,512
Quebec.....	335,158	344,150	413,370	431,017
Nova Scotia.....	25,516	20,046	23,040	24,346
New Brunswick.....	45,500	43,767	36,435	55,789
Manitoba.....	12,200	3,497	1,834	2,816
British Columbia.....	870	615	117	355
Prince Edward Island.....	1,990	1,783	2,673	2,518
Total.....	1,933,693	2,001,230	2,658,485	2,613,353

COAL PRODUCTION OF THE PRINCIPAL COUNTRIES OF THE WORLD.

For the most part in 1887.

Country.	Year.	Quantity.	Country.	Year.	Quantity.
		Tons.			Tons.
Great Britain.....	1887	162,119,812	Spain.....	1886	1,000,000
United States.....	1887	116,049,604	India, Bengal.....	1886	951,001
Germany.....	1886	73,037,506	Japan.....	1884	900,000
France.....	1887	21,402,949	New Zealand.....	1886	534,353
Austria and Hungary.....	1886	20,779,441	Italy.....	1886	314,145
Belgium.....	1887	19,216,031	Sweden.....	1885	264,000
Russia.....	1886	4,650,000	Borneo.....	1884	5,896
Australia.....	1886	2,830,175	Other countries.....	1887	5,000,000
Canada.....	1887	2,368,890			
			Total.....		432,023,893

The following table shows the coal produced by the principal countries of the world, for the most part in 1888:—

Country.	Year.	Quantity.
		Tons.
Great Britain.....	1888	169,935,219
United States.....	1888	126,819,406
Germany.....	1888	81,863,811
France.....	1888	22,951,940
Austria and Hungary.....	1886	20,779,441
Belgium.....	1888	19,185,181
Russia.....	1886	4,650,000
Australia.....	1886	2,830,175
Canada.....	1888	2,658,134
Spain.....	1887	977,569
Italy.....	1887	243,325
Sweden.....	1887	300,000
Other countries.....	1888	10,000,000
Total.....		457,705,882

Long tons of 2,240 pounds are used with reference to Great Britain, the United States, Australia, India, New Zealand and Russia, and the metric ton 2,204 pounds for continental countries. The aggregate increase in Great Britain and United States as compared with 1887 was 18,585,209 tons.

PRODUCTION OF COAL IN CANADA, 1888.

	Tons of 2,000 lbs.	Value.
		\$
Nova Scotia.....	1,989,263	3,108,224
British Columbia.....	548,017	1,957,204
North-West Territories.....	115,124	183,354
New Brunswick.....	5,730	11,050
Total.....	2,658,134	5,259,832

PRODUCTION OF COAL IN NOVA SCOTIA AND BRITISH COLUMBIA, 1874 TO 1888.

Year.	Nova Scotia.	British Columbia.	Total.
	Tons.	Tons.	Tons.
1874.....	977,446	81,000	1,058,446
1875.....	874,905	110,000	984,905
1876.....	794,803	139,000	933,803
1877.....	848,395	154,000	1,002,395
1878.....	863,081	171,000	1,034,081
1879.....	882,863	241,000	1,123,863
1880.....	1,156,635	268,000	1,424,635
1881.....	1,259,182	228,000	1,487,182
1882.....	1,529,708	282,000	1,811,708
1883.....	1,593,259	213,000	1,806,259
1884.....	1,556,010	394,070	1,950,080
1885.....	1,514,470	365,000	1,879,470
1886.....	1,682,924	326,636	2,009,560
1887.....	1,871,398	413,360	2,284,698
1888.....	1,989,263	548,017	2,537,280
Total.....	19,394,282	3,934,083	23,328,365

FISHERIES OF CANADA, 1889.

PROVINCES.	Value.
	\$
British Columbia.....	3,348,067
Manitoba and North-West Territories.....	167,679
New Brunswick.....	3,067,039
Nova Scotia.....	6,346,722
Ontario.....	1,963,122
Prince Edward Island.....	886,439
Quebec.....	1,876,197
	17,635,256
Home consumption--Estimated at.....	13,490,000
Total production, exclusive of the catch by foreign fishermen.....	31,055,256

N.B.—The above represents the "catch" from less than half of the Canadian fisheries, which are yet partly developed, especially in British Columbia on the Pacific Coast, where the Fisheries are very valuable and extensive.

FOREST.

FOREST PRODUCTION OF CANADA—CENSUS OF 1881.

PROVINCES.

PROVINCES.	TOTAL QUANTITY OF SQUARE TIMBER PRODUCED.	TOTAL NUMBER OF LOGS PRODUCED.	NUMBER OF MASTS AND STAVES.	CORRUS OF LATH- WOOD, TANSBARK AND CORDWOOD.	TOTAL VALUE AT PRICES ESTIMATED.
	25. Estimated Value per cub. ft.	\$1.00 per Log.	\$20.00 Est. Value each.	\$2.00 per Cord	\$ cub.
British Columbia	24,043,877	3,284,143	900	80,880	9,491,352 25
Alberta	896,445	254,775	10	220,043	913,112 25
North-West Territories	109,873	57,886	67	38,369	163,522 25
New Brunswick	3,144,323	5,658,469	54,406	840,698	9,223,615 75
Nova Scotia	4,332,005	27,498,378	8,703	633,512	5,566,933 25
Ontario	51,332,562	22,567,290	23,857	5,531,600	47,316,610 50
Prince Edward Island	910,290	197,343	1,177	161,002	762,707 00
Quebec	25,067,577	13,582,707	101,248	3,956,749	30,033,960 25
Total Forest Production.	111,636,862	48,347,391	192,241	11,491,963	103,364,762 50

The above is intended for comparison with next census to be taken in 1891.

GOLD PRODUCTION IN CANADA, 1862 TO 1888, INCLUSIVE.

Year.	British Columbia.	Nova Scotia.	Quebec.	North-West Territories, including Yukon District.	Ontario.	Total.
	\$	\$	\$	\$	\$	\$
1862.....	4,246,266	141,871				4,660,585
1863.....		272,448				
1864.....		390,349				
1865.....		496,357				
1866.....		491,491				
1867.....	2,662,106	532,563				3,153,597
1868.....	2,480,868	490,555				3,013,431
1869.....	2,372,972	348,427				2,773,527
1870.....	1,774,978	387,392				2,123,405
1871.....	1,396,956	374,972				1,724,348
1872.....	1,799,440	255,349				2,174,412
1873.....	1,610,972	231,122				1,866,321
1874.....	1,305,749	178,244				1,536,871
1875.....	1,844,618	218,629				2,022,862
1876.....	2,474,904	233,585				2,663,533
1877.....	1,786,648	329,205	12,057			2,020,233
1878.....	1,608,182	245,253	17,937			1,949,444
1879.....	1,275,264	268,328	32,972			1,538,394
1880.....	1,290,058	297,823	33,174			1,591,358
1881.....	1,013,827	56,661	17,063			1,094,824
1882.....	1,046,737	301,207	17,787			1,313,153
1883.....	954,085	313,534	8,729			1,246,268
1884.....	794,252	432,971	2,129			1,113,246
1885.....	736,165	355,664	3,981			1,058,459
1886.....	713,788	413,631	1,604			1,148,829
1887.....	903,651	436,939	3,740	62,100	6,700	1,363,196
1888.....	694,559					2,472,973
1889.....	616,731					1,126,210
Total.....	44,570,721	8,892,675	207,846	62,100	6,700	55,103,220

MINERALS.

CANADA'S MINERAL PRODUCTS, 1889.

	\$		\$
Antimony.....	1,100	Manganese ore ..	31,814
Asbestos.....	424,350	Marble and serpentines.....	980
Bricks.....	1,252,667	Mineral paints.....	15,280
Building stone.....	899,165	Mineral water.....	37,390
Cement.....	69,790	Miscellaneous clay products ..	239,385
Charcoal.....	83,573	Petroleum.....	672,978
Coal.....	5,570,742	Phosphate.....	312,152
Coke.....	155,043	Pig iron.....	499,859
Copper.....	855,424	Platinum.....	4,500
Feldspar.....	5,100	Pyrites.....	396,212
Fertilizers.....	26,606	Salt.....	110,387
Fire-clay.....	4,800	Sand and gravel (exports).....	69,506
Flag-stones.....	1,400	Silver.....	343,848
Glass.....	150,000	Slate.....	119,160
Gold.....	1,116,145	Soapstone.....	1,030
Granite.....	78,624	Steel.....	17,822
Graphite.....	1,630	Sulphuric acid.....	148,482
Grindstones.....	30,063	Tiles.....	130,871
Gypsum.....	193,658	The estimated value of mineral products not returned, principally nickel, iron, mica and structural materials, was.....	1,933,732
Iron.....	2,210,062		
Iron ore.....	151,640		
Lead.....	5,863		
Lime.....	265,268		
Limestone, for flux.....	21,969	Making a total of.....	19,500,000

N.B.—All the returns of minerals had not been received when this statement was prepared by the Geological Branch of the Department of the Interior.

EXPORTATIONS.

ABSTRACT of the Total Value of Goods Exported from the Provinces of Canada.
1888-89.

Provinces.	Fisheries.	Mine.	Forest.	Animals and their Produce.	Agricul- tural Products.	Manufac- tures.	Miscel- laneous Articles	Total Exports.
	\$	\$	\$	\$	\$	\$	\$	\$
British Columbia..	993,623	2,377,052	449,026	397,685	14,831	46,976	55,113	4,334,306
Manitoba.....	71,264	314	49	545,365	86,443	61,547	17,624	782,609
New Brunswick...	705,117	105,692	4,958,679	346,215	171,444	362,759	50,992	6,700,898
N.-W. Territories.								
Nova Scotia....	4,383,582	674,035	1,710,673	396,728	693,042	928,083	46,158	8,832,281
P. E. Island.....	221,210	275	8,011	464,915	214,805	57,661	1,896	978,773
Ontario.....	397,885	507,436	8,478,610	6,802,627	8,793,288	2,141,882	494,164	27,615,892
*Quebec.....	557,054	1,008,399	8,864,228	15,746,418	7,218,296	1,290,180	216,928	34,845,506
Total.....	7,329,735	4,673,203	24,469,256	24,693,953	17,192,149	4,899,088	882,875	84,140,239

* Add coin and bullion exported to Great Britain..... \$ 17,075

do do United States..... 1,949,276

* Add estimated amount short returned at inland ports and exported to
United States..... 361,751

† Add estimated amount short returned to inland ports and exported to
United States..... 2,708,901

‡ Add coin and bullion exported to the United States..... 11,905

22,720,866

89,189,167

TRADE, ETC.

PERIOD.	IMPORTS.		EXPORTS.		PUBLIC DEBT.		
	Total Value.	Value Entered for Con- sumption.	Total Value.	Loss Debt.	Assets.	Net Debt.	
	\$	\$	\$	\$	\$	\$	\$
Year ended 30th June, 1868..	73,459,644	71,985,306	57,567,888	96,896,666	21,139,531	75,757,135	
do do 1869..	70,415,165	67,402,170	60,474,781	112,361,998	36,502,679	75,859,319	
do do 1870..	74,814,339	71,237,603	73,573,490	115,993,706	37,783,964	78,209,742	
do do 1871..	96,092,971	86,947,482	74,173,618	115,492,682	37,786,165	77,706,517	
do do 1872..	111,430,527	107,709,116	82,639,683	122,400,179	40,213,107	82,187,072	
do do 1873..	128,011,281	127,514,594	89,789,922	129,743,432	29,894,970	99,848,462	
do do 1874..	126,213,582	127,404,169	89,351,928	141,163,551	32,838,586	108,324,965	
do do 1875..	123,070,283	119,618,637	77,886,979	151,693,401	35,655,023	116,038,378	
do do 1876..	93,210,346	94,733,218	80,066,435	161,204,687	36,653,173	124,551,514	
do do 1877..	99,327,962	96,300,483	75,875,393	174,075,834	41,440,525	133,235,309	
do do 1878..	93,081,787	91,199,577	79,323,667	174,957,268	34,595,199	140,362,069	
do do 1879..	81,964,427	80,341,608	71,491,255	179,483,871	36,493,683	142,990,188	
do do 1880..	86,489,747	71,782,349	87,911,458	194,634,440	42,182,852	152,451,588	
do do 1881..	105,330,840	91,611,604	98,290,823	199,861,537	44,465,757	155,395,780	
do do 1882..	119,419,500	112,648,927	102,137,203	205,365,251	51,703,601	153,661,650	
do do 1883..	132,254,022	123,137,019	98,085,804	202,159,104	43,692,389	158,466,715	
do do 1884..	116,397,043	108,180,644	91,406,496	242,482,416	60,320,565	182,161,851	
do do 1885..	108,941,486	102,710,019	89,238,361	264,703,607	68,295,915	196,407,692	
do do 1886..	104,424,561	99,602,684	85,251,314	273,164,341	50,005,234	223,159,107	
do do 1887..	112,892,236	105,639,428	89,515,811	273,187,626	45,872,851	227,314,775	
do do 1888..	110,894,630	102,847,100	90,203,000	284,513,842	49,982,483	234,531,358	
do do 1889..	115,224,931	109,673,447	89,189,167	287,722,063	50,192,021	237,530,042	

CANADA.

FEDERAL FINANCES for the financial Year ended 30th June, 1890, and Revenue for 1888 and 1889.

	1888.	1889.	1890.
	£	£	£
Customs	22,105,926	23,726,783	23,971,351
Excise	6,071,486	6,886,738	7,601,426
Post Office	2,379,241	2,230,503	2,357,388
Public Works	3,556,101	3,642,557	3,800,110
Miscellaneous	1,795,709	2,306,289	2,131,093
Totals	35,908,463	38,782,870	39,861,368
Revenue			39,861,368
Expenditure			35,857,130
Surplus			4,004,238

NOTE.—For fuller information respecting the products and trade, etc., of Canada, herein given, see the "*Statistical Year Books of Canada*," compiled by S. C. D. Roper, for the Department of Agriculture, at Ottawa, during the past five years, down to the date of the 31st May, 1890, and from which most of the preceding tables, of Part V., have been taken.

PART VI.

AGRICULTURAL STATISTICS.

1605--1888.

And Northern limit of Production, etc., so far as
ascertained, in Europe and in Canada.

AGRICULTURE IN CANADA.

From the discovery of Canada by Cartier in 1534 to the beginning of the 17th century, little attention was given to agriculture. The fur trade was the greatest attraction of the colonists. Champlain in 1603, was the first to understand the urgency of cultivation as the principal basis of the settlement of the country. Speaking of the surroundings of Quebec, he states:—"The lands are covered with oaks, cypress, firs, birch, wild fruit shrubs and vines, which in my opinion would yield as much as those of France if they were cultivated." (Sulte).

In 1604 Champlain selected Ste. Croix Island, N.B.; he sowed wheat without reaping it. The terrible havoc made by scurvy amongst the inhabitants decided their removal to Port Royal, opposite Goat Island, on north side of Annapolis Basin. This happened in 1605. Port Royal must be considered the cradle of modern agriculture in Canada. Poutrincourt, Lescarbot and Louis Hébert, the companions of De Monts, always gave good example to the settlers. They were learned men, who cleared land, sowed seed and cultivated their fields.

1607. A water power grist-mill was erected at Port Royal—superseding the laborious "querne." In the same year De Monts presented the King of France, in Paris, with samples of wheat, barley, rye and oats grown at Port Royal, which was afterwards abandoned.
1608. Champlain cleared land at Cape Diamond, Quebec. He sowed wheat on the 1st and rye on the 15th of October.
1609. Champlain reports his vegetable garden flourishing. Corn wheat and oats splendid.
1610. Poutrincourt resumed agricultural pursuits at Port Royal.
1611. Champlain cleared land and he sowed seeds at Pointe à Callières at Montreal; the growth was very satisfactory.
1612. The quantity of grain raised at Port Royal was insufficient for the Colony—gaunt eyed famine stalked forth amongst the people. A root called "chiben," artichokes was the chief sustenance of the famine stricken colony during the winter.
1613. Champlain refers to wheat grown within the precincts of what is now the City of Quebec. The destruction of Port Royal by Argall of Virginia this year, ended, for a time, the agricultural prospects of that place.
1617. Louis Hébert, already referred to, who had gone to France from Port Royal on account of its invasion by Argall in 1613, arrived at Quebec. He was the first farmer in Canada. He died in 1626. His daughter Anne, who married Etienne Couillard at Quebec in 1617, was the first woman to enter hymen's bonds in Canada.
1628. The first ploughing in Canada was done by oxen for Mrs. Hébert, the widow of Louis. The Hébert farm was where the seminary and cathedral now stand.
Kirk or Kirke burned the farm buildings at Cape Tourmente, 30 miles below Quebec. Forty or 50 head of cattle perished.
1629. Quebec taken by the English.
1632. Quebec restored to France.
1664. New France produced more wheat than they required.

1666. Talon, the Intendant, exported peas, boards and fish to the West Indies ; encouraged the cultivation of hemp and flax and the manufacture of ropes and linens.

1667. Talon wrote that New France could then provide the West Indies with flour, fish, wood and oil.

AGRICULTURAL Census of New France, 1667-1765, as given in Census of the Dominion for the Year 1871.

Year.	Arpents under Culture.	Arpents in Pasture.	Wheat.	Oats.	Other Grains.	Horses.	Horned Cattle.	Sheep.	Swine.
				Bush.					
1667	11,448						3,107	85	
1679	21,900					145	6,983	719	
1681	24,827					94	6,898	572	
1685	24,790					156	7,474	787	
1688	28,663		100,971		28,554	218	7,719	1,061	3,701
1692	26,669	2,642	89,762	13,810	(1) 16,897	490	7,456	903	3,045
1695	28,110	3,505	129,154	13,955	(2) 27,200	580	9,181	918	5,333
1698	32,524	5,159	160,978	21,797	(3) 33,552	684	10,209	994	5,147
1706	45,671					1,872	14,191	1,820	
1719	63,032	8,018	234,566	50,416	(4) 52,895	4,024	18,241	8,435	14,418
1720	61,357	10,132	134,439	62,053	(5) 55,490	5,270	24,866	12,175	17,944
1721	62,145	12,203	282,700	64,035	(6) 69,190	5,603	23,388	13,823	16,250
1734	163,111	17,657	737,892	163,988	(7) 72,234	5,056	33,179	19,815	23,646
1765						13,488	78,015	28,022	28,562

(1.) Including 4,597 bushels of corn.

(2.) do 6,490 do

(3.) do 10,251 do

(4.) do 6,487 do

(4.) do 46,408 bushels of peas.

(4.) 45,970 lbs. of flax and 5,080 lbs. of hemp not included.

(5.) Including corn, 4,159 bush. ; peas, 55,331. Not including 67,264 lbs. of flax and 1,418 lbs. of hemp.

(6.) Including 4,585 bush. of barley, 57,400 bush. of peas and 205 bush. of corn. Not including 54,650 lbs. of flax, 48,038 lbs. of tobacco and 2,100 lbs. of hemp.

(7.) Including 3,462 bush. of barley, 63,549 bush. of peas, 5,223 bush. of corn. Not including 92,246 lbs. of flax, 2,221 lbs. of hemp and 166,054 lbs. of tobacco.

New France, in 1765 comprised the three districts of Quebec, Three Rivers and Montreal, containing, on the north shore of the St. Lawrence, from Ile-aux-Coudres up to Cedars 58 parishes, and on the south side, from La-Prairie down to Gaspé 58 parishes.

After 1765 the name of New France was changed to that of the "Province of Quebec." In 1791 it was changed, to Lower Canada. In 1841 to Canada East and in 1867 the old name of the "Province of Quebec" was restored.

NOTE.—For further details, see Part IV.

PROVINCE OF QUEBEC.
Agricultural Statistics from the conquest to 1861.

Year	Arpent under Culture.	Pasture	Wheat	Barley	Oats	Peas	Rye	Buck Wheat	Corn	Other Grains	Potatoes	Horses	Horned Cattle	Sheep	Swine
			Bushels	Bushels	Bushels	Bushels	Bushels	Bushels	Bushels	Bushels	Bushels				
1764	1,300,812														
1807	1,002,198	1,911,367 <i>Arpent</i>										30,146	108,591	84,696	70,461
1851	2,666,213	4,981,823 <i>Arpent</i>	3,407,776		3,262,247	984,758						142,432	405,027	820,122	241,735
1844	2,674,768	4,038,521 <i>Arpent</i>	912,829	1,195,117	7,238,711	1,219,413	333,449	371,801	111,000	1,074,896	7,357,416	116,686	388,796	543,343	295,137
1861	3,045,167	5,208,421 <i>Arpent</i>	3,073,913	495,796	8,977,400	1,415,136	325,422	532,412	401,284		9,918,863	146,726	469,851	602,821	197,935
1861	4,004,236	5,571,183 <i>Arpent</i>	2,654,354	2,281,671	17,551,296	2,648,777	844,192	1,250,125	334,861		4,429,016	148,620	591,562	648,685	251,794
1861											12,770,471	248,515	816,973	682,829	286,400

PROVINCE OF NOVA SCOTIA.

Called Acadia by the French ; from 1710 to 1763 it comprised only the Peninsula. From 1763 it included Ile St.-Jean (Prince Edward Island) ; Cape Breton (Ile-Royale) and New Brunswick, till 1784. In 1819 Cape Breton was reunited to Nova Scotia.

We have already mentioned the foundation of Port Royal, Acadia, in 1605, its desertion in 1607, its reoccupation in 1610 and its destruction by Argall in 1613, during a time of peace between France and England. The following century was marked by the Province passing three times under the Crown of France and four times under that of England. The Treaty of Utrecht, 1713, gave Acadia to England for ever. Agriculture could not increase greatly when the true settlers composing the poorer class suffered the greatest losses by these numerous wars and changes of authority. The census of 1871, however, contains the following agricultural statistics :—

YEAR.	Acadia.	Arpents under Culture.	Arpents in Pasture.	Horned Cattle.	Sheep.	Swine.	Goats, &c.
1671	Acadia	429	.....	866	407	.....	36
1686	do	896	.....	986	759	608	
1693	do	1,832	.....	1,648	1,910	1,164	
1695	River St. John	166	73	38	..	116	361 poultry.
1698	Beaubassin & Port Royal .	1,572	.....	1,334	1,314	746	1,616 fruit trees.
1701	Beaubassin . Mines Basin }	1,136	.....	1,807	1,796	1,173	

PROVINCE OF NOVA SCOTIA.
AGRICULTURAL STATISTICS,
1827 to 1861.

Year.	Acres under culture.	Diked marsh.	Wheat. Bushels.	Barley. Bushels.	Rye. Bushels.	Oats. Bushels.	Pens and Beans. Bushels.	Buck-wheat. Bushels.	Corn. Bushels.	Potatoes. Bushels.	Various Grains. Bushels.	Horses.	Horned Cattle.	Sheep.	Swine.
1827	292,069		152,861							3,278,289	448,627	12,651	116,818	173,731	71,482
1851	799,310	49,012	267,157	196,097	61,438	1,384,437	21,638	179,301	37,475	1,986,789		28,789	243,713	282,180	51,533
1861	971,816	35,487 Salt marsh 29,729	312,681	293,578	59,706	1,978,137	21,333	193,340	15,529	3,824,814		41,927	262,297	332,653	53,217

N.B.—The Loyalists and British immigrants composed the majority of the population.

PROVINCE OF NEW BRUNSWICK.
(Part of Acadia up to 1784.)
AGRICULTURAL STATISTICS.
1840 to 1861

Year.	Acres in Culture.	Acres in Pasture.	Wheat.	Barley.	Oats.	Rye.	Peas.	Black wheat.	Corn.	Potatoes.	Other Roots.	Hay.	Horses.	Sheep.	Swine.	
1840	433,861											Tons.	18,282	90,260	141,053	71,915
1851	643,954	Unimproved Acres.	295,635	74,390	1,411,164		42,663	680,004	62,225	2,792,394	587,683	225,063	22,044	112,218	168,038	47,352
1861	863,108		279,775	94,679	2,656,883	57,504	25,149	904,381	17,420	4,041,389	684,954	324,160	35,347	161,462	211,062	73,966

PROVINCE OF ONTARIO

From 1774 to 1791 formed part of the Province of Quebec; it was called Upper Canada till 1841, Canada West till 1867 and Ontario since that date; in 1784 the number of Loyalists estimated having settled in Ontario was 10,000.

Year.	Area Under Cultivation.	Uncultivated.	Wheat.	Barley.	Oats.	Peas.	Buckwheat.	Rye.	Corn.	Potatoes.	Other Roots.	Hay.	Horses.	Horned Cattle.	Sheep.	Swine.
1825...	599,744	2,753,909	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bush.	Bushels.	Bushels.	Bushels.	Tons.	23,866	Undetermined.	do	do
1827...	645,792	2,933,762											25,228	do	do	do
1828...	717,563	3,008,777											28,388	do	do	do
1831...	818,416	3,569,361											33,428	do	do	do
1832...	916,357	3,800,015											36,822	do	do	do
1833...	988,956	4,165,255											40,254	do	do	do
1834...	1,004,779	4,122,285											43,217	do	do	do
1835...	1,309,785	4,393,434											48,118	do	do	do
1836...	1,283,799	4,805,985											55,064	do	do	do
1837...	1,440,505	4,840,106											57,250	do	do	do
1839...	1,556,677	5,113,406											66,220	do	do	do
1840...	1,713,163	5,298,543											72,696	do	do	do
1841...	1,811,431	5,057,073											75,316	do	do	do
1842...	1,751,528	Occupied.	3,221,989	1,031,334	4,788,167	1,191,550	352,786	292,969	691,359	8,080,402			113,647	504,963	575,730	384,366
1848...	1,780,157	8,413,591	7,568,773	515,727	7,055,730	1,752,834	482,573	446,293	1,137,555	4,751,346			151,380	565,845	833,807	484,241
1851...	3,705,523	9,828,655	12,682,550	625,452	11,395,467	3,027,681	679,636	472,429	1,633,305	4,973,235	Turnips.		3,097,818	744,264	967,168	571,496
1861...	6,051,609	13,364,866	24,620,425	2,821,962	21,250,874	9,601,306	1,248,637	973,181	2,256,290	15,325,920	19,244,568	861,844	377,681	1,015,278	1,170,225	776,001

PROVINCE OF MANITOBA.

(Called Assiniboia till 1870.)

YEAR.	LANDS UNDER CULTIVATION.		CATTLE.		
	Acres.	Horses.	Horned Cattle.	Sheep.	Swine.
1801	2,152	410	2,953		362
1824	3,230	630	5,003		2,053
1838	3,862½	1,113	5,340	457	1,698
1840	4,041	1,292	5,915	1,897	2,149
1863	5,003	1,579	6,201	3,567	1,976
1866	5,380	2,300	6,217	4,223	3,800
1871	6,392	2,085	6,014	3,096	1,565
1886	8,800	2,681	9,615	2,245	4,929

PROVINCE OF BRITISH COLUMBIA.

(Previously called New Caledonia—British Columbia, 1858-1871.)

The returns of stock and crops published in 1870 cannot be relied on; they being evidently erroneous. The mines were the great attractions.*

* Census 1871.

PROVINCE OF PRINCE EDWARD ISLAND.

(Called Ile-St.-Jean.)

In 1763 annexed to Nova Scotia and separated in 1770. The name changed to Prince Edward Island in 1798-1800.

Year.	Acres Cultivated.	Acres Occupied.	Horses.	Horned Cattle.	Sheep.	Swine.
1801	118,417	306,655	5,800	18,951	33,376	10,902
1871	445,103	1,018,240	25,329	62,984	147,364	52,514

AGRICULTURAL STATISTICS of the Dominion of Canada.

PROVINCES.	Acres under Cultivation.	Acres Occupied.	Acres in Wheat.	Wheat. Bushels.	Oats. Bushels.	Rye. Bushels.	Peas and Beans. Bushels.	Buckwheat. Bushels.	Corn. Bushels.
1871.									
Ontario	6,537,438	16,161,676	1,365,872	S. 7,891,989 F. 6,341,400	22,138,958	547,609	7,761,470	585,138	3,148,467
Quebec	3,714,304	11,025,786	242,726	S. 2,035,921 F. 22,155	15,116,262	458,970	2,284,635	1,676,078	693,356
New Brunswick	778,461	3,827,731	18,884	S. 293,592 F. 1,319	3,044,134	23,792	45,636	1,231,091	27,658
Nova Scotia	790,155	5,031,217	19,290	S. 224,410 F. 3,087	2,190,069	33,987	35,203	234,157	23,349
Totals	11,820,358	36,046,410	1,646,781	16,723,873	42,489,433	1,064,358	10,126,364	3,726,484	3,892,880
1881.									
Ontario	8,370,266	19,259,969	1,949,135	27,406,091	40,290,429	1,598,871	9,434,872	841,649	8,096,782
Quebec	4,147,984	12,625,877	224,678	2,019,004	19,990,225	439,242	4,170,456	2,041,670	888,169
New Brunswick	849,678	3,809,621	40,831	521,956	3,267,534	18,268	43,121	1,567,223	18,159
Nova Scotia	942,010	5,396,392	45,045	529,251	1,873,113	47,567	37,220	339,718	13,582
Prince Edward Island	467,211	1,126,653	41,942	546,986	3,538,219	397	3,169	90,458	2,903
Manitoba	230,264	2,384,337	51,293	1,033,673	1,270,268	1,293	8,491	320	2,516
North-West Territories	83,657	441,255	5,678	119,655	59,952	240	1,291	50	1,948
British Columbia	21,214	314,107	7,932	173,658	22,511	482	50,542	59	1,433
Totals	15,112,284	45,338,141	2,366,554	39,350,269	70,493,131	2,097,180	13,749,662	4,901,147	9,025,142

AGRICULTURAL STATISTICS OF THE DOMINION OF CANADA—Continued.

Provinces.	Barley. Bushels.	Area in Potatoes. Bushels.	Potatoes. Bushels.	Rocks. Bushels.	Hay Tons.	CATTLE.			
						Horses.	Horned Cattle.	Sheep.	Swine.
1871.									
Ontario	9,461,253	17,640	17,136,534	25,162,446	1,804,476	489,001	1,403,174	1,514,914	874,064
Quebec	1,608,298	128,185	18,068,323	1,499,253	1,225,640	253,377	683,462	1,007,800	371,452
New Brunswick	70,547	47,680	6,292,355	702,079	344,793	44,786	163,687	231,418	62,805
Nova Scotia	286,040	23,340	3,564,075	618,578	443,732	49,579	273,967	308,377	54,162
Totals.	11,466,038	373,863	47,380,187	27,992,796	3,818,641	836,743	2,624,280	3,155,500	1,366,083
1881.									
Ontario	14,279,841	181,394	18,994,579	40,333,943	2,038,650	500,208	1,702,167	1,350,178	700,922
Quebec	1,751,539	123,082	14,872,287	3,023,380	1,612,104	273,832	949,333	880,833	329,190
New Brunswick	84,183	51,362	6,061,016	1,169,379	414,046	52,975	212,560	221,163	53,087
Nova Scotia	228,745	60,193	7,378,387	1,432,854	567,731	57,167	325,603	377,801	47,256
Prince Edward Island	119,398	39,083	6,042,191	1,240,979	143,791	31,335	90,722	106,496	40,181
Manitoba	253,604	4,366	356,193	198,121	185,279	16,739	60,281	6,073	17,308
North West Territories	48,445	811	80,326	17,384	17,540	10,870	12,872	346	2,775
British Columbia	79,140	3,972	473,831	302,774	43,868	26,122	80,451	27,798	16,841
Totals.	16,844,868	463,922	55,306,730	48,251,414	5,053,068	1,059,358	3,433,989	3,048,678	1,367,619

Grass and clover seeds not included.

COMPARATIVE yield of Wheat and Potatoes in bushels, per acre, in Canada.

PROVINCE.	1851.		1861.		1871.		1881.		1888.	
	Wheat.	Po- tatoes.	Wheat.	Po- tatoes.	Wheat.	Po- tatoes.	Wheat.	Po- tatoes.	Wheat.	Po- tatoes.
Ontario.....	15.8	63.7	17.7	111.6	10.4	98.1	14.6	104.1	(average 1882-89.) 18.0	118.7
Quebec.....	7.4	60.4	10.8	107.5	8.3	140.9	9.0	104.1	.....	.....
New Brunswick	.....	.....	.....	.....	10.8	137.6	12.7	135.5	.....	.....
Nova Scotia	.....	.....	.....	.....	11.7	105.7	11.7	122.5	.....	.....
Prince Edward Island	.....	.....	.....	.....	.....	.....	13.0	154.6	.....	.....
Manitoba	.....	.....	.....	.....	.....	.....	20.1	129.1	(average 1882-87.) 20.6	192.0
North-West Territories	.....	.....	.....	.....	.....	.....	21.2	110.1	(1884.) 21.6	202.9
British Colum- bia.	.....	.....	.....	.....	.....	.....	21.8	141.7	.....	.....

Owing to the want of statistics, the average yield per acre can only be furnished in a few instances.

The want of detail prevents the supplying of information touching the ratio existing between the quantities sown and reaped, &c.

TABLE showing the yield of Wheat per acre in the Wheat-producing Countries of the World publishing returns.

Countries.	Year.	Yield.	Countries.	Year.	Yield.
		Bushels.			Bushels.
England.....	1885	30.8	Egypt.....	1871	15.2
Holland.....	1871-1880	24.7	Canada.....	1881	13.7
Norway.....	Average.	24.3	Greece.....	1867	13.0
Denmark.....	1876-1881	24.2	United States.....	1878-1882	11.9
Belgium...	1878-1882	23.6	Italy.....	1875-1880	11.8
Sweden.....	1878-1881	19.8	Hungary.....	1876-1880	11.3
Germany.....	1878-1882	18.2	Australia.....	1878-1882	10.7
France.....	Average. 1874-1883	16.4	British Indies.....	1884	9.3
Austria.....	1876-1880	15.5	Russia.....	Average.	8.1
Spain.....	.....	15.4	Portugal.....	.....	8.0

Estimated wheat production of the world in 1889—2,041,075,627 bushels.

The average yield of wheat per acre in some of the principal wheat-producing countries is given below:—

Country.	Year.	Yield per acre.	Country.	Year.	Yield per acre.
		Bush.			Bush.
Great Britain.....	1889	29 89	New South Wales.....	1889	13 93
Austria.....	1887	17 65	Victoria.....	Mean of 16 years.	11 35
Hungary.....	1888	19 24	South Australia.....		7 78
France.....	1888	18 18	Queensland.....		10 56
Germany.....	1888	19 47	Western Australia.....		11 71
Russia.....	1887	8 96	Tasmania.....		18 31
India.....	1888	9 21	New Zealand.....	1883-87	26 04
United States.....	1888	10 80	Canada*.....		18 78

*Ontario and Manitoba.

CANADA'S TRADE AND CONSUMPTION OF WHEAT.

The crop of 1881 was.....	Bushels.
The importations were.....	32,350,269
	8,522,724

Total.....	40,872,993
To be deducted (for sowing).....	4,141,120
And the exportations.....	11,600,054
	15,741,174

Balance (home consumption)..... 25,131,819

Canadian population, 1881, 4,324,810 ; consumption per head, 5·82 bushels, or 349 lbs. for the year.

TABLE showing the production of Cereals—Wheat, Barley, Oats, Corn, Buckwheat and Rye, in the countries having agricultural statistics, according to the rank they occupy. Average 1881 to 1887.

Countries.	Production (in Bushels).
1. United States.....	2,720,624,000
2. Russia.....	1,760,000,000
3. France.....	830,000,000
4. Germany.....	737,600,000
5. United Kingdom.....	338,500,000
6. Hungary.....	318,215,000
7. Austria.....	310,500,000
8. Italy.....	273,737,000
9. Canada.....	136,000,000
10. Denmark.....	75,525,000
11. Belgium.....	68,600,000
12. Australia.....	52,500,000
13. Holland.....	36,000,000
Total.....	7,657,801,000

See "Tisserand's Agricultural Statistics of France, 1887."

WHEAT CROP OF THE WORLD IN 1888.

Countries.	Bushels.
North America :—	
*United States.....	415,868,000
*Canada (1881).....	32,350,269
South America :—	
*Argentine Republic and Chili	28,375,000
Europe :—	
Austria.....	51,075,000
Hungary.....	131,746,879
Belgium.....	14,876,130
Denmark.....	4,823,750
France.....	273,620,125
Germany.....	105,000,000
Great Britain.....	76,760,671
Ireland.....	
Greece.....	4,823,750
Italy.....	106,079,370
Netherlands.....	4,256,250
Portugal.....	7,093,750
Roumania.....	51,075,000
Russia, exclusive of Poland	254,619,000
Servia.....	4,540,000
Spain.....	101,156,875
Sweden.....	4,256,250
Norway.....	312,125
Switzerland.....	1,702,500
Turkey.....	42,562,500
Asia :—	
India.....	266,882,112
Asia Minor.....	38,306,250
Persia.....	22,700,000
Syria.....	14,187,500
South-East Asia	8,512,500
Africa :—	
Cape of Good Hope.....	3,819,686
Algeria.....	19,862,500
Egypt.....	14,187,500
*Australasia.....	47,588,161
Total.....	2,153,049,403

* These are exporting countries which have a surplus of wheat.

NORTHERN LIMITS OF PRODUCTION OF CEREALS, ETC.

CANADA AND EUROPE, ETC.

Localities.	Latitudes North	Longitudes West.	Agricultural Products.
<i>Alaska, United States.</i>			
Fort Yukon, at Junction of Yukon and Porcupine Rivers, at about 1,300 miles north-eastward from Behring Sea.	66 37 0	145 20 0	Barley is grown at this station, together with various cereals, fruits etc. Russian records give 63.7° for July, 60° for August and 59.7° for the mean of June, July, August temperature. Elevation above the sea, 412 feet; this was probably taken by Capt. C. W. Raymond, of U. S. C. of Engineers, in 1869.
<i>Canada.</i>			
New Fort Good Hope, on the Mackenzie River, 120 miles south of Old Fort, about 310 miles south of mouth of the Mackenzie, on Polar Ocean.	66 16 0	128 31 0	Turnips, onions, lettuce and potatoes the size of large hens' eggs. Ten kegs of 10 gallons give 25 kegs of same capacity. Mean temperature of July at Old Fort, +58.80°.
Fort Norman, on the Mackenzie, 170 miles south of New Fort Good Hope, 314 miles north of Fort Simpson.	64 54 18	125 43 6	Barley, potatoes, turnips and other vegetables. Mean summer temperature, +59.87°. The Mackenzie at Fort Norman, 150 feet above Polar Sea.
Fort Simpson, an island at junction of Mackenzie and Liard River, 793 miles south from mouth of the Mackenzie.	61 52 0	121 25 12	Wheat, barley, potatoes, turnips, onions, lettuce etc. Barley ripens 12 to 20 August. Wheat sometimes succeeds. Mean summer temperature, +55.37°. Elevation of river above Polar Ocean, 241 feet.
Fort Providence, 46 miles below Great Slave Lake, 167 miles below Fort Resolution, 158 miles above Fort Simpson.	61 30 0	117 12 0	Wheat, barley, potatoes, turnips, onions, lettuce etc. Barley is a sure crop. Sixty kegs of potatoes gave 1,400. Mean August temperature, +43.00°. Elevation of Great Slave Lake above Polar Ocean, 391 feet.
Fort Chipewyan, at lower or west end of Lake Athabasca, 306 miles above Fort Resolution, 194 miles below Fort McMurray.	58 42 38	111 18 20	Wheat 68 to 69 lbs. per bushel won prize at the last Centennial Exhibition. Barley and all sorts of vegetables. Mean summer temperature, +53.37°. Rain 52 days. Snow 67 days. Elevation of lake above Polar Ocean, about 600 feet.
Fort Liard or Halket, 295 miles above Fort Simpson, at junction of Rivers Liard and Mackenzie.	59 0 0	123 40 0	Wheat, barley, rye, oats, Indian corn, potatoes, turnips and other vegetables put in the ground towards 10th May, are generally mature towards end of August. Flowers blossom first week of May. Wheat is a sure crop 4 years out of 5. Climate similar to that of Manitoba, but improved by Chinook winds. Frost penetrates ground about 4 feet. River freezes over about middle of October.
Fort Dunvegan, on the Peace River branch of the River Mackenzie, 604 miles southwest from Fort Chipewyan, Lake Athabasca, 135 miles east of Rocky Mountain Portage.	56 08 0	118 13 0	Wheat, barley, pease, corn and potatoes have been raised here for about 100 years, and have seldom failed. Fifty lbs. of wheat sown 16th April gave 27 bushels 27th August; 15 lbs. Egyptian barley sown 18th April yielded 15 bushels threshed of 60 lbs. per bushel. Squashes, beets, carrots, cauliflowers, cabbages, onions, beans, lettuce, cucumbers and turnips are abundant. (See Ogilvie's Rep. 1889). Mean summer temperature, +52.5°. Mean yearly temperature, +28.8°. Elevation of Peace River above Polar Ocean at this Fort, probably 1,600 feet.
Edmonton, on the North Saskatchewan, 196 miles north of Calgary.	53 35 0	113 30 0	Red Fife and Club wheat besides other grain and a variety of vegetables are grown successfully. Ladoga wheat would ripen two weeks earlier. Highest summer temperature, +88.0°. Lowest winter temperature, -57.0°. Elevation of Saskatchewan above Atlantic 2,253 feet.

NORTHERN LIMITS OF PRODUCTION OF CEREALS, ETC.—*Con.*

CANADA AND EUROPE, ETC.

Localities.	Latitudes North.	Longitudes West.	Agricultural Products.
<i>Canada—Con.</i>	° ' "	° ' "	
Cumberland House, on south side of Pine Lake, upon north side of the North Saskatchewan, 690 miles southwest from York Factory, travelled distance per Franklin—425 miles northwest from Winnipeg, 648 miles eastward from Edmonton.	53 56 40	102 16 41	Luxuriant crops of wheat, barley and corn, with all sorts of vegetables, are raised here. Mean summer temperature, +62.62°. Elevation of Pine Lake and North Saskatchewan above the Atlantic per Col. Lefroy, 900 feet.
Valley of River Qu'Appelle west of Fort Ellice.	51 0 0	100 0 0 to 105 0 0	Wild hops grow luxuriantly in the valleys of the Red and Qu'Appelle Rivers. They also grow in the valley of the River Kaministiquia, near lat. 49.
<i>Europe.</i>			
Northern portion.....	67 30 0	.....	Oats.
" "	67 0 0	.....	Barley.
" "	65 0 0	.....	Rye.
Norway, Drontheim.	64 0 0	.....	Wheat.
Sweden.....	62 0 0	.....	"
Russia, towards St. Petersburg.	60 15 0	.....	"
" Central	59 0 0	.....	"
Germany, south-east of Denmark.	52 0 0	.....	Maize.

NORTHERN LIMITS OF PRODUCTION OF CEREALS, Etc.

CANADA AND OTHER COUNTRIES.

Cereals, &c.	Countries.	Latitudes.	Longitudes.	FAHREN- HEIT.		Elevation above the Sea approximate.	Remarks.
				Maximum Summer.	Mean Sum- mer.		
		° ' "	° ' "			Ft.	
Barley.....	Lapland.....	70 0 0					Barley and rye generally ripen
do.....	Poland.....	70 0 0					5° further north than wheat.
do.....	Northern Russia...	68 0 0					Potatoes and turnips ripen 1°
do.....	Eastern do.....	68 0 0					north of barley in the various
do.....	Western do.....	67 0 0					localities.
do.....	Alaska, U.S.....	66 37 0	145 20 0	59 70		412	At Fort Yukon at Junction of
							Yukon and Porcupine Rivers,
do.....	Canada.....	64 54 3	125 43 6	59 87		150	1,300 miles from Behring Sea.
							At Fort Norman, Mackenzie
do.....	do.....	58 25 0	116 0 0	90 61 00		1,000	River.
do.....	Norway.....	67 0 0					At Fort Vermilion, Peace River.
Rye.....	Sweden.....	65 0 0					Barley is the principal crop; it
do.....	Russia.....	64 0 0					thrives as far as lat. 70° north.
do.....	Canada.....	59 0 0	123 40 0	95 62 62			
							At Fort Halket on the Liard
Oats.....	Europe (Northern)...	67 30 0					River, near Rocky Mountains.
							Oats, rye and barley ripen in
do.....	Norway.....	65 0 0					Europe as far north as lat. 68°.
do.....	Sweden.....	63 30 0					
do.....	Canada.....	59 0 0	123 40 0	95 62 62			
							At Fort Halket, on the Liard
do.....	Scotland.....	58 40 0					River branch of the Mac-
do.....	Europe.....	52 0 0					kenzie.
Maize (Indian corn)...	Canada.....	56 8 0	118 13 0	52 59 1		1,600	
							It requires a summer of 65° Fah-
do do ..	do.....	53 56 0	113 30 0	62 52			renheit, with one month at 67°.
							Fort Dunvegan, on the Peace
do do ..	do.....						River branch of the Mackenzie
							Cumberland House, near the
Wheat.....	Norway.....	64 0 0		60			North Saskatchewan.
							Wheat in Europe is not much
do.....	Sweden.....	62 0 0					cultivated beyond 60°; this
do.....	Canada.....	61 52 0	121 25 12			241	range diminishes towards the
							east. The northern limit is
do.....	Western Russia...	60 15 0					generally 58° for a sure crop.
do.....	Central do.....	59 0 0					
do.....	Canada.....	59 0 0	123 40 0	95 62 62			
							At Fort Halket wheat is a re-
do.....	Great Britain...	58 0 0					liable crop 4 years out of 5.
do.....	Canada.....	53 35 0	113 30 0	88 57 20		2,253	
							At Edmonton, Red Fyfe and
Hops.....	Canada.....	51 0 0	100 0 0				Club wheat. Lowest temper-
							ature - 57° Fah., in winter.
							Valley, River Qu'Appelle. The
							climate where hops grow is
							suitable for wheat.
Potatoes.....	Iceland.....	66 39	{ 13 0 0 to 24 0 0 }				The size of walnuts.

NORTHERN LIMITS OF PRODUCTION OF CEREALS, &c.—*Con.*

CANADA AND OTHER COUNTRIES.

Cereals, &c.	Countries.	Latitudes.	Longitudes.	Fahrenheit.		Elevation above the Sea approximate.	Remarks.
				Maximum Summer.	Mean Summer.		
Potatoes	Canada	66 16 0	128 31 0	{ July 55-80 }			New Fort Good Hope, Mackenzie River, the size of hens' eggs. The temperature given was recorded by Franklin in July, 1826, at Old Fort Good Hope, 120 miles further down the Mackenzie. The temperature of the New Fort must, therefore, be greater.
Turnips	Lapland	72 0 0					
do	Canada	66 16 0	128 31 30	{ July 55-80 }			At New Fort Good Hope, on the Mackenzie, in May, June, July, August, the hours of sunlight amount to 2,398. At Ottawa they amount to 1,805.
Grapes	Austria	53 0 0					
do	Germany	54 0 0					
do	Canada	51 0 0	101 30 0				On the Assiniboine, north of Fort Ellice.
Apples	Europe	64 0 0					
do	Canada	61 50 0	125 25 2				In Canada the apple tree yields on as wide an area as produces wheat. A collection of apples from Hamilton, Ont., was pronounced by the judges of the London Industrial Exhibition of 1862, "As the best from any country." The Annapolis Valley, Nova Scotia, (The Land of Evangeline), is famed for the quantity and quality of its apple productions. 300,000 barrels of apples were grown in the Counties of Annapolis, Kings and Hants in 1889. See Note*

* NOTE.—Hamilton is situated Lat. 43° 54' N., Long. 79° 57' W., and at 372 feet above the sea. The Annapolis Valley is situated between Latitudes 44° 45' and 45° 15' N., and between Longitudes 64° and 66° W.

CULTIVATION OF CEREALS.

Europe, in this respect, comprises three parallel zones from the south-west to the north-east, from the Atlantic to the Ural Mountains.

The first, or northern zone, comprises the islands of the Arctic Ocean, Scotland and its islands, Norway, the greatest portion of Sweden, Finland, northern Russia and the Ural Mountains as far as the 59th degree of latitude. Its principal grain consists of oats.

The second or central zone embraces England, Ireland, northern and central France, Germany and Poland. Its principal grains are buckwheat, barley and wheat, which are cultivated simultaneously or separately, or together with oats towards the north, and with Indian corn towards the south.

The third or southern zone, which includes Spain, the south of France, Italy, Carniole, Greece, Turkey, the Principalities of the Danube, Hungary, southern Russia and the Crimea. Its chief grain is Indian corn, and in a lesser proportion, wheat.

See "Dictionnaire général des sciences théoriques et appliquées par Deschanel et Foulon."

DATES OF WHEAT CROPS IN THE PRINCIPAL COUNTRIES OF THE WORLD.

Wheat grows almost everywhere on the surface of the Globe and is harvested nearly every month of the year. The following are the months during which it ripens in various countries :—

<i>January</i>	Australia, New Zealand, Argentine Republic.
<i>February and March</i> ...	British Indies and Upper Egypt.
<i>April</i>	Mexico, Egypt, Turkey of Asia, Persia, Syria, Asia Minor, Cuba.
<i>May</i>	Northern Africa, Central Asia, China, Japan, Texas, Florida.
<i>June</i>	California, Spain, Portugal, Italy, Greece, Oregon, Louisiana, Alabama, Georgia, Kansas, Colorado, Missouri.
<i>July</i>	Roumania, Bulgaria, Hungary, Austria, France, Southern Russia, Nebraska, Minnesota, New England, Upper Canada.
<i>August</i>	England, Belgium, Holland, Germany, Denmark, Poland, Lower Canada, Manitoba, North-West, British Columbia.
<i>September</i>	Northern Canada, Scotland, Sweden, Norway.
<i>October</i>	Northern Russia.
<i>November</i>	Peru, Southern Africa.
<i>December</i>	Birmaniam.

This continuous production of wheat has generated large commercial transactions. The nations not using bread made of wheat, are very few; the countries not producing enough for their wants, are supplied from the surplus of other countries. With steam and electricity there is no more fear of those famines which have destroyed so many thousand lives. Wheat can be carried to any place of the earth, in a comparatively short time.

PART VII.

MACKENZIE BASIN AND NORTH-WEST CHAIN OF RIVERS AND LAKES.

YUKON TERRITORY AND LAKE ST. JOHN REGION.

MACKENZIE RIVER REGION.

During the Session of 1888, a Select Committee was appointed by the Senate to enquire as to the value of that part of the Dominion lying north of the Saskatchewan water-shed, east of the Rocky Mountains and west of Hudson's Bay, comprising the Great Mackenzie Basin, its extent of navigable rivers, lakes and sea coast, of agricultural and pastoral lands, its fisheries, forests and mines.

According to the report of this Committee, presented by their Chairman the Honourable John Schultz, M.D., 2nd May, 1888, they arrived at the following conclusions :—

REGARDING NAVIGATION.

1st. The extent of the scope of the inquiry covers one million two hundred and sixty thousand square statutory miles, which area includes none of the islands of the Arctic Archipelago.

2nd. Its coast line on the Arctic Ocean and Hudson's Bay measures about 5,000 miles, exclusive of inlets and deeply indented bays.

3rd. Over one-half of this coast line is easily accessible to whaling and sealing crafts.

4th. The navigable coast lines of the larger lakes of the region in question, amount to about 4,000 miles, while its total lacustrine area probably exceeds that of the eastern Canadian American chain of great lakes.

5th. That there is a river navigation of about 2,750 miles, of which 1,390 are suitable for stern-wheel steamers, which, with their barges, may carry 300 tons; the remaining 1,360 miles, being deep enough for light draught sea-going steamers.

6th. That there is a total of about 6,500 miles of continuous lake, coast and river navigation, broken only in two places.

7th. That the two breaks in question are upon the Great Slave and Athabasca Rivers, the first being now overcome by a 20 miles waggon road from Fort Smith southward on the Great Slave River, and the latter being a stretch of 70 miles on the Athabasca, of questionable navigation above Fort McMurray, down which flat boats or scows descend but cannot ascend, and which about 50 miles of waggon road would overcome, while some improvement of the rapids might render the whole river navigable.

8th. That with suitable steam-crafts this river and lake navigation may be connected with Victoria and Vancouver, by way of the mouth of the River Mackenzie, the Arctic Ocean and Behring Straits and Sea, and it is now connected on the south by 90 miles of waggon road between Athabasca Landing and Edmonton, with navigable waters in the Saskatchewan River.

ARABLE AND PASTORAL LANDS.

	Probable area in Square Miles.
Suitable for the growth of potatoes.....	656,000
do barley	407,000
do wheat	316,000

The pastoral area is estimated at 860,000, of which 26,000 is open prairie, with occasional groves, the remainder being wooded more or less; 274,000 square miles, including the prairie, may be considered as arable land.

Spring flowers and the buds of deciduous trees appear as early, north of Great Slave Lake, as at Winnipeg, St. Paul, Minneapolis, Kingston or Ottawa, and earlier along the Peace, Liard and other western affluents of the Great Mackenzie River, where the climate resembles that of Western Ontario.

FISHERIES, FORESTS AND MINES.

According to the evidence received by the Committee, the quantity of sea and fresh water fishes is sufficient to supply a great portion of the North American Continent.

The forest area has upon it a growth of trees well suited for all purposes of house and ship building, for mining, railway and bridging purposes, far in excess of its own needs.

As regards the mines of this vast region, little is known of the portion east of the Mackenzie River and north of the Great Slave Lake. On the western side of the Mackenzie and along the head waters of its affluents, the Peel, Liard and Peace Rivers the auriferous area is estimated at from 150,000 to 200,000 square miles. Silver is found on the Upper Liard and Peace Rivers, copper on the Copper-Mine River which may be connected with an eastern arm of Great Bear Lake by a tramway of 40 miles. Iron, graphite, ochre, brick and pottery clay, mica, gypsum, lime and sandstone, sand for glass and moulding, and asphaltum are all known to exist. The petroleum area along the Athabasca River, Great Slave River, Little Slave and Great Slave Lakes and the Mackenzie River, is so extensive as to justify the belief that it is the greatest in America, if not in the world, and that eventually it will supply the larger part of North America and be shipped from Churchill or some other great northern Hudson's Bay port to England. The Committee recommend that a tract of about 40,000 square miles of the petroleum region be reserved from sale, between Athabasca Lake, Peace River and Little Slave Lake.

Salt and sulphur deposits are less extensive, but the former is found in crystals equal in purity to the best rock salt and in highly saline springs, while the latter is found in the form of pyrites. There are extensive coal and lignite deposits on the lower Mackenzie and elsewhere. Scientific exploration has not yet extended north of Great Slave Lake.

The chief present commercial product of the country is its furs; the region in question is the last great fur preserve of the world.

The Indian population is sparse, and, having never lived in large communities, is peaceable.

According to the evidence received, the distances which separate the navigable waters of the Mackenzie Basin from the eastern and western sea coasts, and from navigable rivers and railways to the south and south-east, are as follows:—

From the Head of Great Slave Lake to head of Chesterfield Inlet, 320 miles; from the head of Athabasca Lake to the harbour of Churchill, 440 miles; from Fort McMurray at the junction of the Clearwater with the Athabasca, below the 70 miles of questionable navigation, to the following places on the Saskatchewan: Prince Albert, 300 miles; Fort Pitt, 220 miles; Victoria, 179 miles; Edmonton, 225 miles; from Calgary, on the Canadian Pacific Railway, to Athabasca Landing, on the Athabasca River, 250 miles; from head of Little Slave Lake to Peace River Landing on the Peace River, 65

miles; from Hazleton, on the Skeena River, to Peace River, in the Pass, 150 miles; from Port Mumford, on the Stikeen River to Fort Liard, on the Liard River, 370 miles.

The Committee state that the region in question occupies an area greater than the Australian continent or two-thirds of Europe, covering part of the British Islands, Norway, Sweden, Denmark, Germany, Austria and a part of France and Russia.

MACKENZIE RIVER.

The first expedition down this river was that of Alexander Mackenzie, who had been employed during eight years at the trading post of Chipewyan, on Lake Athabasca.

He left the fort 3rd June, 1789, descended the Great Slave River, reached Great Slave Lake on the 9th and the Mackenzie on the 29th. He passed the outlet of Great Bear Lake River 5th July, and reached the end of Whale Island at the mouth of the Mackenzie, on the Polar Ocean, 15th July. On his voyage down the river he found various encampments of Indians, most of whom refused to accompany him to the Polar Ocean, being in dread of the Esquimaux who resided along the coast.

The various forts from Chipewyan down the Mackenzie to the Polar Sea had not apparently been built at the time of Mackenzie's journey in 1789. They appear to have been erected prior to the two expeditions of Sir John Franklin, 1819 to 1822 and 1825 to 1827, except Fort Confidence, which was erected in 1825 by Sir John Richardson, one of his staff, at the north-east end of Great Bear Lake and Fort Enterprise, which was erected in August and September, 1820, by Franklin himself during his journey to the Copper-Mine River.

The Hudson's Bay and North-West Companies built forts in opposition to each other, until their coalition in 1826-27.

Franklin descended the river to its mouth in August, 1825, and returned to spend the winter at a fort built by the North-West Company at the foot or west end of Great Bear Lake in September. This fort was named Franklin.

He descended the river a second time to its mouth, with his assistants, Back and Richardson, 24th June, 1826.

From the mouth he proceeded westward with two boats along the coast of the Polar Sea to Icy Reef, and Richardson proceeded also with two boats eastward to the mouth of the Copper-Mine River.

Franklin returned by the Mackenzie to Fort Franklin, 21st September, 1826.

Richardson returned by the Copper-Mine River and the portage at east end of Great Bear Lake to Fort Franklin, 1st September, 1826.

For further particulars see in Part IV, Franklin's Three Expeditions.)

MACKENZIE RIVER.

Average width from Fort Simpson to Polar Sea, $1\frac{1}{2}$ miles.
 Sixteen to twenty-seven fathoms deep at mouth, in the ocean.
 Shoalest portions 7 to 8 feet, up stream.
 Narrowest portion $\frac{1}{2}$ a mile.
 Widest portion 3 to 4 miles with islands.

From mouth on Polar Ocean up to Fort Good Hope	310	Stat. M.
the distance is estimated at about.....		
Thence up to Fort Simpson.....	484	do
Thence to Fort Resolution, Great Slave Lake	324·5	do

Total statute miles.....	1,118·5
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There are rapids near Fort Good Hope at about 310 miles above the mouth of the Mackenzie; but boats ascend them with lines without unloading.

In June, July and August the temperature is generally very hot, with occasional thunderstorms and rains; the nights are very cold; summer rains begin about the first of May; snow falls about the tenth of October; the river freezes over about the same time, and the ice breaks up about the first of June.

FOREST TREES.—Birch, poplar, balsams, hemlock, pine and the red willow.

MINERALS.—Red earth, sulphur, coal, salt, white earth, limestone, iron-stone, sandstone.

PLANTS.—Strawberries, gooseberries, cranberries, blueberries, lichens or tripe à la roche, wild tea.

All along the Mackenzie and the Athabasca, the fur animals are :—Beaver, marten, silver fox, lynx, otter, cross fox, blue fox, red fox, musquash or muskrat, mink, black and cinnamon bears, wolves, wolverines, moose-deer and hares. The food animals amongst these are the beaver and bear, moose and hares.

Towards the ocean, the musk-ox and reindeer are found along the coast. —*See lists of furs sold in 1887, in London, and of furs received in Montreal, 1881–88–89, on next page.*

In the valley of the Mackenzie, wood and white partridges, geese of all kinds (spring and fall), cranes, wavies, swans and ducks are abundant; the ducks and geese arrive about middle of May, and leave about beginning of October.

The fish in the river are chiefly loche, whitefish, and the inconnu, resembling salmon, averaging 10 to 12 pounds and sometimes 30 to 40 pounds in weight; in the adjacent lakes whitefish and trout are chiefly found.

Along the coast, seals, porpoises and whales are numerous.

Steamers can navigate the Mackenzie throughout, from 1st of July to 1st of October.

MACKENZIE RIVER REGION.

NORTHERN FURS CHIEFLY FROM THE MACKENZIE BASIN.

ONE year's catch offered for sale in 1887, in London, by the Hudson's Bay Company, and by C. M. Lampson & Co., consignees of many of the furs of British North America.

Description.	Number.	Description.	Number.
Badger	3,739	Lynx	14,520
Bear, all kinds	15,942	Marten	98,342
Beaver	104,279	Mink	376,223
Ermine	4,116	Musk Ox	198
Fisher	7,192	Musquash	2,485,368
Fox, blue	1,440	do extra black	13,944
do cross	6,785	Otter	14,439
do grey	31,597	Rabbit	114,824
do kitt	290	Sable	3,517
do red	85,022	Skunk	682,794
do silver	1,967	Swan	57
do white	10,257	Wolf	7,156
Hair seal, dry	13,478	Wolverine	1,581

Some idea of the size and importance of the fur trade may be obtained from the following figures of the receipts of furs at the Hudson's Bay Company's warehouse, in Montreal, during the last three years. The figures have been kindly furnished by the manager in Montreal :—

Kinds of Furs.	Number of Skins.		
	1887.	1888.	1889.
Bear	1,399	1,528	2,037
Beaver	22,848	22,174	18,787
Fisher	1,197	1,120	1,377
Fox	669	756	1,150
Lynx	2,655	3,830	4,107
Marten	19,264	18,986	16,708
Mink	10,002	7,757	6,420
Musquash	81,103	74,572	55,285
Otter	2,768	2,550	3,010
Skunk	228	420	478
Wolverine	24	21	27
Total	142,157	133,714	109,386

There has been, it will be seen, a steady falling off in the number of skins, though the three years aggregate a total of 385,257 skins, and it seems evident that some such course as that suggested by the committee of the Senate is, if feasible, highly desirable, if the principal fur-bearing animals are to be saved from gradual extinction.

(See Year Book—Dep. of Agriculture, 1889, Ottawa.)

MACKENZIE RIVER REGION.

OPENING and Closing of Navigation.

FORT McMURRAY—Latitude 56° 40'.

Year.	Ice Broke Up.	First Drift Ice.	Ice Set. — River Closed.
1878	18th April.	27th October.	No record.
1879	No record.	20th do	1st November.
1880	2nd May	14th November.	No record.
1881	21st April	14th October.—The river became clear of ice for some time, after which drift ice again appeared, until finally the ice set and closed the river.	12th November.
1882	24th do	1st November	8th do
1883	25th do	30th October	10th do
1884	27th do	18th do	28th October.
1885	9th do	23rd do The river became clear of ice for some time, after which drift ice again appeared, until finally the ice set and closed the river.	13th November.
1886	16th do	4th November	14th do
1887	27th do	22nd October.	24th October.
1888	4th May.	3rd November	9th November.

MACKENZIE RIVER REGION.

OPENING and Closing of Navigation, etc.

FORT SIMPSON—Latitude 61° 52' N.

Year.	Ice Broke Up.	First Drift Ice.	River Closed.
1876	14th May	4th November	7th November.
1877	8th do	1st do	28th do
1878	8th do	16th October	26th do
1879	3rd do	12th November	20th do
1880	7th do	2nd do	26th do
1881	13th do	12th October.	18th do
1882	7th do	1st November	30th do
1883	1st do	25th October. The first drift ice in the Mackenzie this year was seen 1st Nov	20th do
1884	12th do	11th October.	18th do
1885	2nd do	28th do	20th do
1886	13th do	13th do	25th do

The dates of the breaking of the ice in the Mackenzie, above the Liard, for the same year are as follows :—

1876	Not given	1882	20th May.
1877	19th May	1883	5th do
1878	17th do	1884	14th do
1879	19th do	1885	7th do
1880	19th do	1886	27th do
1881	19th do		

The river is always open some time before the lake. In the latter, the ice floats around for some weeks before it is sufficiently broken up to pass down the river. In 1888 it was well on in July before the lake was clear enough to enable the steamer to proceed to Fort Smith, but that was an unusually late season. As a rule, navigation on the lake, opens in the last days of June. At Fort McPherson on Peel River, the ice does not generally leave until the 1st of June. On Lake Athabasca the ice goes a little earlier than on Great Slave Lake, but this does not affect the question of the navigability of the Mackenzie, which cannot be reached until Great Slave Lake is clear.

MACKENZIE RIVER REGION.

OPENING and Closing of Navigation, etc.

NEW FORT NORMAN—Latitude 64° 54' 3" N.

Year.	Ice Broke Up.	First Snow.	First Ice Formed.	River Closed.
1872.	Not given	28th September.....	7th October.....	8th November.
1873.	17th May.....	28th do	21st do	12th do
1874.	25th do	15th October	2nd November	18th do
1875.	24th do	Not given	23rd October	9th do
1876.	19th do	10th October	13th do	9th do
1877.	12th do	25th September.....	18th do	Not given.
1878.	Not given	28th do	22nd do	17th November
1879.	9th May.....	3rd October.....	20th do	7th do
1880.	22nd do	7th do	22nd do	12th do
1881.	Not given	2nd do	7th do	12th do
1882.	14th May.....	9th do	14th do	14th do
1883.	11th do River was not clear of ice this year until 28th May	9th do	24th do	10th do
1884.	28th May.....	Rest of record lost..	No record.....	No record.
1885.	No record	No record.....	No record.....	No record.
1886.	do	do	18th October.....	13th November.
1887.	24th May.....	23rd September..	5th do	8th do
1888.	19th do .....	.....	.....	.....

MACKENZIE RIVER REGION.

INDIAN POPULATION.

Places.	Total.
Resolution, Great Slave Lake.....	300
Fort Smith, Great Slave River.....	200
Chipewyan, Lake Athabasca.....	500
Fond du Lac do.....	250
Vermilion, Peace River.....	300
McMurray, Junction of Athabasca and Clearwater Rivers.....	150
Total.....	1,700

WHITE POPULATION.

Places.	Men.	Women.	Boys.	Girls.	Total.
Rampart House, River Yukon Region.....	2	1	1	2	6
La Pierre's House and Fort McPherson.....	11	6	12	9	38
Good Hope, River Mackenzie Region.....	8	4	6	8	26
Norman do.....	2	2	1	4	9
Liard, Liard River do.....	7	4	4	5	20
Nelson do.....	5	3	5	3	16
Simpson do.....	14	6	9	10	39
Providence do.....	13	14	8	7	42
Rae do.....	8	4	8	6	26
Big Island do.....	5	4	9	8	26
Totals.....	75	48	63	62	248

INDIANS.

Rampart House.....	80	68	73	65	286
La Pierre's House.....	36	41	25	39	141
McPherson.....	93	87	95	76	351
Good Hope.....	178	142	132	131	583
Norman.....	74	76	58	46	254
Liard.....	46	47	75	48	216
Nelson.....	44	42	66	57	209
Simpson.....	130	136	124	110	500
Providence.....	92	106	142	116	456
Rae.....	128	147	188	152	615
Esquimaux at McPherson.....	80	100	80	90	350
Totals.....	981	992	1,058	930	3,961

MONTREAL TO THE MOUTH OF THE MACKENZIE, ON THE POLAR OCEAN.

PRESENT ROUTE by the Canadian Pacific Railway to Calgary, thence by waggon road to Edmonton and Athabasca Landing, thence by water.

LOCALITIES.	SITUATION.	STATUTE MILES.				
		Waggon Road.	Railway	York Boats or Portages.	Steamer	Total from Montreal.
Montreal.....	On the River St. Lawrence..					
Calgary	Alberta District, N.W.T.		2,264			2,264
Edmonton.....	North Saskatchewan River, Air Line, 172 miles.....	196				2,460
Athabasca Landing.....	River Athabasca, Air Line, 86 miles.....	96				2,556
Grand Rapids ...	River Athabasca.....				168	2,724
Fort McMurray.....	do			83		2,807
Athabasca Lake.....	do				189	2,996
Fort Chipewyan.....	Lake Athabasca, north side.....				5	3,001
Fort Smith Portage.....	Great Slave River.....				102	3,103
do Foot of Portage.....	do west side.....			14		3,117
Fort Resolution, on south side of Great Slave Lake.....	do				190	3,307
West end of Great Slave Lake.....	Great Slave Lake.....				121	3,428
Fort Providence.....	Between Beaver and Little Lake, on the Mackenzie River.....				46	3,474
Fort Simpson.....	On Island at Junction of Rivers Mackenzie and Liard.....				158	3,632
Fort Wrigley.....	Mackenzie River.....				134	3,766
Fort Norman, 22 miles below Old Fort.....	do				180	3,946
Great Bear River, East.....	do				0.2	3,946.2
Ramparts.....	do				160.4	4,106.6
New Fort Good Hope.....	do				8.8	4,115.4
Red River, West.....	do				214.6	4,330.0
Peel River Junction.....	32 miles below Fort McPherson.....				28.0	4,358.0
Mouth of River Mackenzie.....	On the Polar Ocean.....				67.0	4,425.0
	Totals.....	282	2,264	97	1,772.0	4,425.2

COMPARATIVE DISTANCES, WINNIPEG TO LIVERPOOL, ENGLAND.

Routes.	Statute Miles.	Geographical Miles.
Winnipeg to York Factory, or mouth of Nelson River, on west side of Hudson Bay.....	750	651
York Factory to Hudson Strait, at Digges Islands.....	630	547
Hudson Strait to Atlantic, at south end of Resolution Island, on north side, or to Cape Chudleigh, on south side of outlet of Strait, into the Ocean.....	500	434
From Hudson Strait, across the Atlantic, to Liverpool, England.....	2,162	1,875
†Total—Winnipeg to Liverpool, <i>via</i> York Factory, Hudson's Bay..	4,042	3,507
Winnipeg to Quebec, by Canadian Pacific Railway, direct, <i>via</i> St. Martin's Junction, not calling at Montreal.....	1,569	1,361
Quebec to Liverpool, <i>via</i> Strait of Belle Isle.....	3,067	2,661
†Total—Winnipeg to Liverpool, <i>via</i> Quebec—Summer Route.	4,636	4,022
Winnipeg to Montreal, <i>via</i> Canadian Pacific Railway.....	1,423	1,234
Montreal to St. John, New Brunswick, <i>via</i> Short Line, Sherbrooke and Mattawamkeag.....	481	417
St. John to Liverpool.....	3,112	2,700
Total—Winnipeg to Liverpool, <i>via</i> St. John, New Brunswick—Winter Route.....	5,016	4,351

* Hudson's Bay and Strait generally navigable from 15th July to 15th October. August and September are the safest months for navigating Hudson Strait.

† For route *via* Cape Race, add 182 statute miles, 158 geographical miles.

DESCRIPTION
OF THE
PRINCIPAL LAKES AND FORTS OR TRADING STATIONS
IN THE
NORTHERN TERRITORIES OF CANADA.

(Arranged alphabetically.)

ABITIBI LAKE.

MIDWAY BETWEEN LAKE NIPISSING AND JAMES' BAY.

Latitude, 48° 38' to 49° N. ; Longitude, 78° 25' to 80° 20' W.

Elevation above Lake Temiskaming, 245 feet ; elevation above the sea at Three Rivers, estimated at 857 feet.

R. C. Mission in the Apostolic Vicariate of Mgr. Lorrain. Rev. J. M. Nédelec, O.M.I., visits this post.

Indians—7 families of 24 persons in all, along the river, and 80 families, of 320 persons, residing in neighbourhood of lake.

The lake is surrounded by level clay land, which is almost unbroken towards the north and especially towards the north-west.

Between the lake and James' Bay the soil is fertile and the climate temperate and suitable for the production of all kinds of grain and for the raising of cattle. Barley, oats, rye, peas and beans succeed well. Wheat has been grown at Abitibi House, Flying Post and New Brunswick, on or about the 49th parallel, and at Lac Seul, between the 50th and 51st parallel. Indian corn, a more delicate plant than wheat, has come to maturity at Osnaburgh House, on Lake St. Joseph, north of the 51st parallel.

TREES.—White and red pine are found scattered over the whole region between Lake Temiskaming and Lake Abitibi. They are abundant and of excellent quality along both sides of the Height of Land. Several trees are from 8 to 9 feet in circumference. White spruce, yellow birch and cedar are also tolerably abundant and of good size. Sugar maple is also plentiful towards the head of Lake Temiskaming, but is not seen further north. The most abundant tree in this region, north of the limit of sugar maple, is aspen, after which are canoe birch, spruce, banksian pine and Canada balsam. Elm and ash occur occasionally on low flats as far north as Lake Abitibi.

A company was incorporated in 1884 by the Act 47 Vic., chapter 80, amended by Act 49 Vic., chapter 77, in 1886, for the construction of a railway from North Bay, Lake Nipissing, to Lake Temiskaming and thence to Lake Abitibi and to Moose Factory, James' Bay, the southern extremity of Hudson's Bay, a distance of about 350 miles in a direct line.

Wild animals and feathered game are abundant in the region towards James' Bay.

ATHABASCA LANDING,

ON THE UPPER PORTION OF THE ATHABASCA RIVER, AND STEAMBOAT NAVIGATION
NORTHWARD TO THE MOUTH OF THE MACKENZIE.

From the Landing to Edmonton there is a trail or waggon road 96 miles in length (the direct distance being 86), over which the Hudson's Bay Company hauls all the trading outfit for the posts northward.

The freight rates between the two points is about two cents per pound.

From Edmonton the trail to Calgary, which is the nearest point on the Canadian Pacific Railway, is 196 miles in length, which is equivalent to a journey of 4 days' travelling.

From Athabasca Landing, the steamer "Athabasca" runs up the Athabasca to Little Slave River, 68 miles above the Landing, and up the latter stream several miles; the distance thence to Lesser Slave Lake is about 60 miles; thence to the post at the west end of the lake the distance is about 60 miles more; thence there is a cart trail of 63 miles to Peace River Landing.

From Athabasca Landing the steamer "Athabasca," on her journey eastward and northward, runs down the Athabasca 168 miles to the head of the Grand Rapids. Between this and Fort McMurray there are 83 miles of rapids, on which the Hudson's Bay Company has a line of boats capable of carrying 10 tons each.

The same company have a second steamer, the "Graham," which runs from Fort McMurray down the Athabasca River to Lake Athabasca and to Fort Chipewyan, a distance of 194 miles, and thence down the Great Slave River to the head of the "Fort Smith Portage," a further distance of 102½ miles.

They have a third steamer, the "Wrigley," for their service, which runs from Fort Smith down to the delta of the Mackenzie, a distance of 1,273 miles. The least draft of water in that distance, varies from 7 to 8 feet.

If the Mackenzie delta has the same draft, the entire navigable distance from Fort Smith downwards to the Polar Sea would be about 1,340 miles.

ATHABASCA LAKE TO GREAT SLAVE LAKE.

ATHABASCA RIVER.

From Athabasca Landing down the Athabasca River to Fort Chipewyan, on the north side of Athabasca Lake, a distance of 445 miles, the navigation for steamers is interrupted about 83 miles from the head of Grand Rapids down to Fort McMurray. In July, portions of the river, when the water is high, are about one and a half miles in width.

Trees.—Birch, poplar, balsam, hemlock, pine and the red willow generally grow upon the lands in the vicinity of the river.

Minerals.—Red earth, sulphur, coal oil, salt, white earth, limestone, ironstone and sandstone.

The indications of petroleum seen in the region west of the Athabasca, between Peace River and Little Slave Lake, are such that the Schultz Committee of 1888 consider it capable of supplying the greater part of North America. They recommend Government to reserve the region from sale. It comprises a tract of about 40,000 square miles.

Animals.—The beaver, marten, silver, cross, blue and red foxes, the muskash or muskrat, the mink, wolf and wolverine, black and cinnamon bears, the lynx and others.

ATHABASCA LAKE.

Elevation above the sea, about 600 feet, or the same as that of Lake Superior.

Greatest length, 180 Stat. M. from extreme east end to Fort Chipewyan, near outlet, per map of Capt. Deville, Surveyor General.

Greatest breadth, 55 Stat. M., per map of Capt. Deville, Surveyor General.

Ordinary breadth, 5, 20, 30 Stat. M., per map of Capt. Deville, Surveyor General.

Area, about 4,400 square miles.

Bishop Clut states that it is a magnificent lake, suitable for navigation by steamers of the largest size.

The country to the south and south-west of it, is level but sandy, wooded, and in some places fertile, while on the north side it is rocky or covered with boulders, hilly and mostly barren.

Hon. Mr. Christie, who was examined before the Schultz Committee in 1888, states that the country is not adapted for agriculture near Athabasca and Great Slave Lakes.

The country north of Athabasca Lake is crossed by lower part of Peace River, the elevation of which is from 600 to 700 feet above the sea.

The water in the lake is deep and is clear, except at the west end where the muddy water of the Athabasca River is received and also part of the Peace River at high water.

The lake in the neighbourhood of the R. C. Mission at Chipewyan freezes to a depth of 4 feet,

The ice breaks up a little earlier than on Great Slave Lake, where navigation generally opens during the last days of June.

Fish:—Whitefish, trout of several kinds, pike and carp, etc., are abundant.

FORT CHIPEWYAN (CHIPIOUYAN).

Lat., $58^{\circ} 42' 38''$ N.; Long., $111^{\circ} 18' 20''$ W.—*Franklin*, 1820.

do $58^{\circ} 42' 32''$ N.; do $111^{\circ} 19' 0''$ W.—*Franklin*, 1825.

do $58^{\circ} 43' 0''$ N.; do $111^{\circ} 18' 7''$ W.—*Lefroy*.

Variation, $25^{\circ} 29' 37''$.—11th July, 1825.

Near outlet W. end of Lake Athabasca, N. side.

Elevation above the sea, 600 feet.

Anglican Episcopal Mission, under Bishop R. Young.

Roman Catholic Mission—Nativité de la Vierge Marie, comprising a convent, 6 Grey nuns, 25 pupils. This Mission is under the care of Rev. Albert Pascal and L. Ledoussal, O.M.I., in the Vicariate Apostolic of Mgr. Henri J. Faraud, O.M.I. (The latter died 27th September, 1890, since this was written.)

Mgr. Isidore Clut, his Auxiliary, is to transfer his headquarters there in 1890.

Franklin's winter quarters, 26th March to 18th July, 1820.

Alexander Mackenzie had charge of this fort in 1781, and resided there several years. His first expedition to the Polar Sea in 1789, and his second expedition, 1792-1793 across the Rocky Mountains to the Pacific Ocean, were both from this fort.

Franklin and Dr. Richardson returned here 15th and left 25th July, on their first journey down the Mackenzie.

This Fort (Chipewyan) was built by the North-West Company, with a lofty tower to watch the Indians, who had threatened to massacre all the whites. It is a very extensive establishment on a lofty hill upon the north shore of the lake. The tower was built towards 1812.

The Indian population in the vicinity of this fort numbers about 500.

1886—	Mean temperature,	June, July, August,	+53.97 to + 58.70.
	do do	January, February, December,	+13.57 to - 3.33.
"	Highest do	in summer,	+83.30.
"	Lowest do	in winter,	- 49.00.
"	Mean do	during an entire year,	+24.41 to 27.52.
"	Number of days' rain,	52 during a year.	
	do snow,	67 do	
"	Inches of rain—	6.74 during a year.	
"	do snow—	78.40 do	
"	Percentage of cloudy weather,	54.00.	
1887.	Hours of sunlight :	514 in May, 549 in June, 530 in July, 467 in August.	
"	Total hours of sunlight at Chipewyan—	2,060, summer months.	
	do do at Ottawa—	1,805 do	

On the north side of Athabasca Lake, around Chipewyan, there is little or no soil of any description, the country being all bare Laurentian rock.

The country around the fort is wooded with pine, spruce, tamarac and poplar.

The Hudson's Bay Company have a garden at the fort, of upwards of an acre in extent, and the Anglican Mission one of smaller area, but the soil is very sandy. The Roman Catholic Mission have a garden also, most of which they obtained by draining a bog.

In the season of 1883, which was a favourable one in that district, being free from summer frosts, the Hudson Bay Company raised about four hundred bushels of potatoes, the Anglican Mission thirty bushel on a small patch, and the Roman Catholic Mission about five hundred bushels.

Many of the retired Hudson Bay Company's servants also have small patches which they cultivate ; potatoes and fish being the principal articles of food used during the winter.

Wheat, barley, rye and oats sown about 10th May are reaped about 10th August. Turnips and other vegetables, strawberries and gooseberries are also grown here with success. The wheat grown here weighs from 68 to 69 lbs. per bushel ; it was awarded a prize by the last Centennial Exhibition.

WHITEFISH.

In 1888, during the autumn, the Hudson Bay Company required 36,000 whitefish for the use of their post, the R. C. Mission 12,000 and the rest of the population at least 30,000 more. Most of these were caught within three weeks, while Mr. Ogilvie was there. (See his report, 16th July, 1889).

Fresh fish is abundant at all the posts along the lake ; they are frozen for preservation during the winter.

WILD GEESE.

From 30,000 to 40,000 wild geese are killed here in the course of autumn from year to year.

COAL.

Coal, four to five feet thick, is found in the limestone rock of the mountain ; it is older, much harder and better than the lignite coal.

FORT CHURCHILL HARBOUR AND RIVER, ON WEST SIDE OF HUDSON'S BAY.

1886—Lat. $58^{\circ} 43' N.$ —Long. $94^{\circ} 10' W.$ —Lieut. Gordon's Expeditions, 1884, 1885, 1886.

A few turnips are grown with difficulty.

Cattle are raised and bred, and excellent butter is made.

See evidence of Hon. Mr. Christie, Schultz Committee, 1888.

In summer, the twilight lasts a couple of hours; the remainder of the day is all day light. In winter the nights are very long; darkness begins at about half past three or four in the afternoon and lasts until 9 a.m. the next day.

TEMPERATURE, ETC.

June, July, August, 1886—Mean $+40.00$.

December, 1885, January, February, 1886—Mean -42.89 .

July, August, 1886—Highest $+43.33$.

February, 1886—Lowest -55.00 .

Frost never leaves the ground except for a few inches, 10 to 30.

Days' rain, Sept., 1885, to Sept., 1886, 65 during 12 months.

Days, snow, Sept., 1885, to Sept., 1886, 37 during 12 months.

Hours of fog, Sept., 1885 to Sept., 1886, 418 during 12 months.

Depth of snow on level ground varies from 2 to 3 feet.

Average of most windy day 24.81 M. per hour, during 12 months, 1885-86.

Ice forms in harbour about 15th November every year.

Ice breaks up in river about 28th June, and the river is clear about 15th July.

Ice breaks up in harbour about the 15th June.

Ice near Marble Island is $7\frac{1}{2}$ feet thick.

The factor at Churchill states that the ice in the bay never extends far enough to intercept the view of open water. The bay is navigable early in June.

Spring tides rise $15\frac{1}{2}$ feet in the bay.

Neap tides rise 8 feet in the bay.

CHURCHILL HARBOUR.

This is the best and only safe harbour on the western coast of Hudson's Bay. It is 2,841 Geog. M.=3,272 Stat. M. from Liverpool.

The basin for anchorage is about 1,500 yards north and south by about 1,000 east and west, and has a depth of four fathoms at low water.

The holding ground is excellent, the bottom being mud, and though the tide runs very rapidly, about six knots at half tide, this harbour is an eminently safe one. It is admirably suited for a railway terminus.

The necessary docks could be easily and cheaply built, and the deep water basin enlarged at small cost. Stone is lying at the water's edge ready to be laid into docks and piers and nature seems to have left little to be done in order to make this a capacious port for doing a business of great magnitude.

CHURCHILL RIVER.

White whales (porpoises) ascend the river with the tide, each day, in great numbers. Each porpoise is worth about \$100.

In 1883, the Company secured nearly 200 in one tide at Churchill.

Whitefish, salmon and trout are abundant in this and all the streams around the bay.

For further details see "Hudson's Bay."

FORT CONFIDENCE, AT N. E. END OF GREAT BEAR LAKE.

Is the most northerly habitation of white men. It is beyond the Arctic circle, or at $66^{\circ} 53' 36''$ of north latitude, and $118^{\circ} 40' 0''$ of west longitude.

Erected and named by Simpson in 1837.

Simpson and Dease were there three winters, 1836-37, 1837-38, 1838-39.

They never failed a single day to have an abundant supply of food.

Although the lake was closed ten months out of the twelve, the season being exceptionally severe, they had abundance of fish, deer, musk-ox and meat of other kinds, at all times.

CUMBERLAND HOUSE.

On south side of Pine Lake, north side of North River Saskatchewan.

Lat. $53^{\circ} 56' 40''$ N.; Long. $102^{\circ} 16' 40''$ W.—*Franklin*, 22 Nov, 1819.

Var. $17^{\circ} 17' 29''$ Dip. North $83^{\circ} 12' 50''$ do do

Lat. $53^{\circ} 57' 33''$ N.; Long. $102^{\circ} 21' 46''$ W.—*Franklin*, 28 June, 1825.

Var. $19^{\circ} 14' 21''$ E.; Dip. N. $80^{\circ} 21' 7''$ do do

These observations were taken by Sir John Franklin, who remained at this post 22nd October, 1819, to 18th January, 1820, on his outward journey during his first expedition, and returned here on his outward journey during his second expedition, 15th June, 1825.

Supposed elevation above the Atlantic, according to Colonel Lefroy, 900 feet.

690 miles, south-west from York Factory—travelled distance, per Franklin.

425 miles north-west from Winnipeg.

648 miles eastward from Edmonton.

Mean summer temperature $+62.62^{\circ}$.

Temperature observed by Chief Factor John Lee Lewis, in 1839-40, from 23rd to 30th May, 78° to 93° Fah.; October 1— 68° Fah. above zero.

Luxuriant crops of wheat, corn and barley, together with all sorts of vegetables, are grown here.

The Roman Catholic Indians in the Cumberland District number 490 Maskegons, in 1890; they are in the diocese of Mgr. Vital Grandin, who resides at St. Albert, about 12 miles north-west of Edmonton.

On 1st October, 1840, potatoes being ripe were harvested. They were planted 13th May.

FORT DUNVEGAN, ON PEACE RIVER.

Latitude, $56^{\circ} 08'$; longitude, $118^{\circ} 13'$, per Ogilvie. 100 miles west of west end of Little Slave Lake, in a direct line; 604 miles south-westward from Fort Chipewyan, Lake Athabaska; 60 miles west above the Forks of Peace and Smoke Rivers, towards Peace River Landing; 135 miles eastward from Rocky Mountain Portage; elevation above the sea said to be 1,600 feet.

Anglican Episcopal Mission, under Rev. Mr. Brick, in the Diocese of Bishop R. Young.

Roman Catholic Mission of St. Charles, under Rev. Le Serrec, Sup., and Le Treste, O.M.I., in the Diocese of Mgr. Henri J. Faraud.

Roman Catholic Indian School under the same in 1886.

Mean temperature—Summer + 52.3°; year + 28.8°.

Snow disappears about middle of April; cultivation begins towards May; the river begins to freeze in November; the depth of snow is about 2 feet during winter; in 1883, only 20 days of rainy weather.

At Dunvegan, notwithstanding the severity of the frosts, the crops are very good both in quality and quantity. When I was there (1883) the Roman Catholic missionaries had threshed their grain, samples of which I brought back. The yield was as follows:—50 pounds of wheat were sown on the 16th April and reaped on the 20th August, and 27 bushels threshed of good clear grain; 15 pounds of Egyptian barley sown on the 18th April and reaped 20th August, and 15 bushels threshed, weighing fully 60 pounds to the bushel.

The Hudson's Bay Company and Episcopal Mission had not threshed, and could not give their returns; but they were well satisfied with their crops of all kinds. The Rev. Mr. Brick, of the Episcopal Mission, was already using bread, when I was there, made from wheat of the present year's growth (1883). See report of Mr. Ogilvie, 16th July, 1889.

The Hudson's Bay Company have raised wheat, barley and potatoes for upwards of a hundred years at this post; the crops have seldom failed.

In 1886 a magnificent crop of wheat, barley, peas, potatoes, turnips, squashes, beets, carrots, cauliflowers, cabbages, onions, beans, lettuce, cucumbers, &c., was raised on the prairie land, some 36 miles from Dunvegan.

The Rev. Tissier, a Roman Catholic missionary for some years at the latter place, tried oats and obtained an astonishing return.

EDMONTON.

At 196 miles, by trail or waggon road, north from Calgary.

413 miles by the North Saskatchewan River, west from Lake Winnipeg.

1,073 miles by North Saskatchewan and Lake Winnipeg from City of Winnipeg.

96 miles, by trail or waggon road, south from Athabasca Landing.

Lat. 53° 35' N.; Long. 113° 30' W.

Elevation above the sea, 2,253 feet.

Mean temperature, summer - 57.2; year + 31.7.

It has three churches, Anglican, Catholic and Methodist; a sawmill, two grist mills, one or more hotels, a telegraph office and several stores.

Mgr. Vital Grandin, bishop of the Roman Catholic Diocese of St. Albert, resides at St. Albert, about 9 miles further north-westward.

The vicinity of Edmonton is rich in coal, gold and other minerals; the coal is now being worked.

Red pine and spruce are abundant; the leaves begin to appear in May.

Grain and vegetables of various kinds are raised successfully.

Three steamboats run regularly between Edmonton and Winnipeg.

During ordinary seasons navigation is open from April to the middle of October. For details see further on. See also in Addenda the Mission of Lake St. Anne, the first that was founded, at 50 miles from Edmonton.

Highest temperature $+88^{\circ}$ summer months.
 Lowest do -57° winter do
 Mean do $+8.33^{\circ}$ do do
 Number of days rain fell, 15 ; inches of rain, 4.53.
 do snow fell, 26 ; do 26.90.

FORT FOND DU LAC.

On north side of Lake Athabasca, towards east end.

Latitude, about $59^{\circ} 45'$; Longitude, nearly 108° .

140 statute miles, north-east from Fort Chipewyan, which is situated at lower end of lake.

There is a Roman Catholic Mission here, named Notre Dame des Sept Douleurs, under the care of Rev. A. H. De Chambreuil, O.M.I., in the Vicariate Apostolic of Mgr. H. J. Faraud.

The number of Indians in the vicinity of, or frequenting, this station, according to the Rev. Grouard, O.M.I., Roman Catholic Missionery at Chipewyan, is about 250.

Bishop Clut states that the post here is for trading dry provisions and grease from the Chipewyans who hunt the reindeer on the barren grounds. It is a great resort, he says, for wild fowl passing south in the fall. Geese and swans alight there in millions to feed.

FORT AT FRANCIS LAKE.

Established by Campbell in 1842.

Campbell discovered the Pelly River in 1840.

Bell discovered the Lower Yukon, 1845.

The latter went down the Porcupine or Rat River in three days, in 1842.

Yukon, established 1847.

Selkirk, established 1848.

FORT FRANKLIN.

At lower or south-west end, near outlet of Great Bear Lake.

Latitude $65^{\circ} 11' 56''$ N. ; Longitude $123^{\circ} 12' 44''$ W. ; Variation $38^{\circ} 59' 20''$ E.—Per *Franklin*, 19th September, 1825.

1826—Summer, mean temperature $+50^{\circ} 20$.—June, July, August.

1825-26—Winter do $-17^{\circ} 00$.—Dec., Jan., February.

1826—Highest temperature $+60^{\circ} 26$.—July.

1826—Lowest do $\begin{cases} -31^{\circ} 60. & \text{—January.} \\ -49^{\circ} 00. & \text{—do during two days.} \end{cases}$

Franklin left this Fort with Lieut. Back and Dr. Richardson, on 24th June, 1826, for the Polar Sea, after having spent the winter there since September, 1825.

He returned there from the Polar Sea on the 21st September, 1826, and remained until middle of May, 1827.

For further details, see Great Bear Lake.

TEMPERATURE.

FORT FRANKLIN and Fort Rae.

Mean Temperature during	Fort Franklin, Lat. 65° 12'.	Fort Rae, Lat. 62° 40'.
	Fah.	Fah.
May.....	35°·2	27°·7
June.....	51°·4	51°·4
July.....	52°·0	61°·2
August.....	50°·6	56°·5

FORT GOOD HOPE (NEW OR UPPER).

Latitude, 66° 16'; Longitude, 128° 31'.

On east side of the Mackenzie; 120 miles above site of the Old Fort Good Hope on west side; 2½ miles above the Hare Indian River and 2 below the Ramparts; 170 miles below Fort Norman; 274·7 miles above Fort McPherson, the most northerly fort.

Fort Good is near the Arctic Circle.

In 1836 the Fort had been moved up to the Upper Manitou Island, whence it was swept by a flood, and was afterwards built on its present site.

Franklin, on his way down the Mackenzie to the Polar Ocean, passed at Old Fort Good Hope 1st July, 1826, for which he gives latitude 67° 28' 21", and longitude 130° 54' 38", the variation of compass being 47° 28' 41" east.

The temperature recorded by him, 1st to 7th July, 1826, on his way from the fort down to the mouth of the Mackenzie, varies from +41°·6 to 55°·8 Fahrenheit.

The Hudson's Bay Company has half a dozen houses here and some stables.

The R. C. Mission of Notre Dame de Bonne Espérance, comprising the convent of the Sisters of Charity, at this post has been under the Rev. Jean Séguin, O.M.I., during the past 30 years; he is assisted by the Rev. Mr. Giroux, O.M.I. This mission is in the Vicariate Apostolic of Mgr. Faraud, of whom Mgr. Clut is the Auxiliary. The interior of the Mission Church is one of the best finished in the country.

Many of the buildings and fences are painted with a dull red colouring matter, consisting of the ashes of wood that had lain several years in the river.

The white population at or in the vicinity of this post is 26, and the Indian population is about 583.

The sun does not rise here from 1st November to 11th January.

The hours of sunlight, compared with Ottawa, are as follows:—

At New Fort Good Hope: 592 in May, 662 in June, 625 in July, 519 in August.

At Ottawa: 456 in May, 462 in June, 464 in July, 423 in August.

Total number of hours of sunlight at New Fort Good Hope ... 2,398

do do Ottawa..... 1,805

Greatest cold, December, January, February, 1885, varied from —14° to —50° per Centigrade thermometer.

Greatest cold, December, 1884, January and February, 1886, -14° to -50° .

Greatest cold, 21st and 29th January, 1887, -53° .

In July and August, 1888, the days were pleasant and warm, and the nights not unpleasantly cool.

Turnips, carrots, onions, lettuce and potatoes are raised at this post, and wild roses are abundant. The potatoes are the size of large hens' eggs.

Flour delivered here, costs \$30 per bag of 100 lbs.

In winter and in summer, those who reside at this post live mainly on fish and barley soup.

GREAT BEAR LAKE AND THE COPPER-MINE RIVER.

Greatest length of lake, 175 statute miles in a direct line from Fort Confidence at head or east end of lake, in latitude $66^{\circ} 58' 36''$ and longitude $118^{\circ} 40'$ to Fort Franklin, at lower or south-west end, above outlet of lake, latitude $65^{\circ} 11' 56''$ north, and longitude $173^{\circ} 12' 44''$ west.

Length along navigation line, 250 miles.

Breadth varies generally from 25 to 30 and 45 or more miles.

Greatest breadth from McTavish Bay, south-east side to head of Smith's Bay, north-west side of lake, 185 statute miles.

Depth, over 270 feet.

Area, about 11,200 square miles.

Height above the sea, per Dr. Richardson of the Franklin expedition, 200 feet.

Lake begins to freeze over, latter part of September.

Centre of it, not frozen until late in December and even in January.

Ice goes out towards end of June.

Dr. Richardson left Fort Franklin, in company with Franklin, 24th June, 1826, descended Bear River, and the Mackenzie; reached the Polar Sea 7th July.

Franklin with Back and a portion of party went westward with two boats some 374 miles to Icy Reef which he reached 31st July; he left there 1st August on his return journey and arrived at Fort Franklin 21st September.

Dr. Richardson with the remainder of the party and two boats, coasted eastward; he reached the mouth of the Copper-Mine, latitude $57^{\circ} 58'$, longitude $115^{\circ} 18'$, 8th August; the thermometer that day was at 86° in the sun; he ascended the river until the 13th and crossed overland to north-east end of Great Bear Lake, which he reached on the 18th, at 115 miles from the mouth of the Copper-Mine; he coasted some 318 miles along the lake shore, partly by boat and partly by canoe and arrived back at Fort Franklin, 1st September, 1826.

He states that the first 40 miles of the Copper-Mine, are full of rapids and that the river is practicable only for boats drawing a few inches of water.

GREAT BEAR LAKE.

The temperature at sunset was $+62^{\circ}$.

He saw small herds of reindeer, passed stunted spruce and fir groves, and encamped 11th August, among small pines in latitude $67^{\circ} 33'$; saw many grey marmots.

On the 13th he left the Copper-Mine ; going direct overland to the Great Bear Lake. The rocks were red old sandstone, clay, slate and greenstone ; he passed scattered and thin clumps of pine ; saw wolves in the mountains ; temperature was $+53^{\circ}$. Sandflies were troublesome.

On the 14th to 17th, saw partridges (latitude $67^{\circ} 10'$) and met with wooded valleys. Saw much wood in the valleys far to the west and north. Bog whirtle berries were abundant.

On the 17th Indians came laden with tongues and fat half-dressed meat ; two deer killed.

17th to 19th August. Passed over rising ground covered with white spruce.

20th to 21st August. Fished in Great Bear Lake where pike, carp and whitefish were caught.

22nd August to 1st September. Journey over lake to Fort Franklin.

Dr. Richardson during his journey from the Polar Ocean, met with wooded valleys, had fish and deer meat every day, occasionally partridges, and musk-ox one day.

Hearn in his two expeditions, 1769-70 to discover Copper-Mine River, found deer plentiful, swans, geese and partridges and killed three musk-oxen ; on the barren grounds west of Hudson's Bay he says that foxes were very plentiful, also lynx, the polar and grizzly bear and the wolverine.

Sir John Richardson states that in 1825-26 when he was wintering on the northern arm of Great Bear Lake, he took out 50,000 whitefish and over 3,800 trout in eighteen months, weighing from 5 to 30 lbs. each, and that other fish were there in innumerable quantities.

The temperature varied from 58° to 62° in the evening at sun-down during the summer months.

GREAT SLAVE LAKE.

Greatest length, 300 to 320 statute miles, per map, Department of Interior, 1887, from ruins of Fort Reliance at east end to Fort Providence, 46 miles below west end of lake.

Greatest breadth, 180 statute miles ; from south side up to head of North Arm, 40 miles beyond Fort Rae.

General breadth varies from 10 to 60 statute miles.

Area, about 10,100 square miles.

Height above the Mackenzie at Fort Simpson, 150 feet, or about 391 above the sea. Its waters are transparent, like those of the great lakes of the St. Lawrence.

Great Slave Lake was sounded with a 65-fathom line (390 feet) without reaching the bottom, which is below the sea. It is supposed to be as deep as Lake Superior.

This lake, owing to its great depth, is seldom completely frozen over before the last week of November, and the ice, which is generally 7 feet thick, breaks up about the middle of June, three weeks later than the ice of the Great Slave River. Navigation generally opens towards July.

The only known outlet to this vast body of water which receives numerous streams on its north and south shores, is the Mackenzie River.

The eastern shores are very imperfectly known.

The Indians say there is a communication from its eastern extremity, by a chain of lakes, with a shallow river which discharges its waters into the Polar Sea ; this stream, which they call the Thlouee-tessy, is navigable for small canoes. only

On the north side of the lake, there is an arm comprising two extensive bays which stretch far towards the north-westward, 40 miles beyond Fort Rae ; the upper bay receives the water of a river which communicates with Marten Lake.

The Indians report that there are extensive deposits of mica on the south side of the lake.

Bituminous limestone and tar springs are also found along the lake.

In 1883 the Hudson's Bay Company caught and used 75,000 whitefish in this lake ; they weighed about $2\frac{1}{2}$ lbs. each, or in all about 190,000 lbs. There are many other varieties of fish ; trout are often caught, weighing 40 lbs.

FORT HALKET.

On the Rivière aux Liards, near Rocky Mountains ; 150 miles south-westward of Fort aux Liards, which is in Lat. $60^{\circ} 5'$ and Long. $121^{\circ} 20'$ or thereabout at 145 miles south of Fort Simpson, River Mackenzie.

Lat. about 59° N. ; Long. about $123^{\circ} 40'$ per map.

	Men.	Women.	Boys.	Girls.	Total.	
White population.....	7	4	4	5	20	per Census, 1881.
Indian do	46	47	75	48	216	do
	53	51	79	53	236	

R. C. Mission of St. Raphaël, under the supervision of Revs. H. Lecomte and J. Gourdon, O.M.I., in the Vicariate Apostolic of Mgr. H. J. Faraut.

The climate here is severe in winter and to a certain extent similar to that of Manitoba, owing no doubt to the Chinook winds. All kinds of grain and garden plants and vegetables come to maturity here, according to Chief Trader McDougall ; he states that barley ripens most years as far as the Arctic Circle or say to $66\frac{1}{2}^{\circ}$ of latitude N.

Wheat, barley, rye, oats, Indian corn, sown about 10th of May, turnips, potatoes and other vegetables planted in May, are generally mature towards end of August. Strawberries and gooseberries ripen at an earlier date. The flowers begin to blossom towards the first week of May.

Wheat is a reliable crop, four years out of five.

Frost penetrates the soil about four feet ; the river freezes over, about the middle of October and opens about the 8th of May.

HUDSON'S BAY AND STRAITS.

This bay extends from 51° to 63° of north latitude, a distance of about 825 statute miles in length and from 78° to 95° of west longitude, a distance of about 600 statute or of 521 geographical miles in breadth.

Hudson's Strait is about 500 statute miles in length and 100 in breadth, or 434 geographical miles in length and 87 in breadth.

NAVIGATION.

The Bay is navigable early in June, its waters being warmer than those of the Straits.

The period of navigation during an ordinary year in the Bay and Straits is estimated as being from 15th July to 15th October, with a possibility of a fortnight longer in spring and autumn for strongly built vessels with propellers of small dimensions, well down in the water.

FISHERIES.

The fish and mammals possessing commercial value in these waters are—

The right whale, the white whale, the narwhal or unicorn, the walrus, seals of various kinds, salmon, trout and whitefish. The right whale ascends into the Gulf of Boothia, beyond the 70th degree of latitude.

Codfish are very plentiful in all the coves and inlets of Ungava Bay, but not beyond it.

FAUNA.

The terrestrial mammalia of the Straits and northern part of the Bay are chiefly: the polar bear, white, grey, red and black foxes, reindeer, wolves and hares.

Geese, swans, ducks, ptarmigans and other kinds of game birds, are plentiful.

FOREST TREES.

Spruce, tamarac, balsam-fir, canoe-birch, aspen and balsam-poplar are reported to exist in the interior of Northern Labrador, at some distance from the coast of the Atlantic and the Straits, except along the rivers and brooks, which are generally fringed with spruce and tamarac.

On the west side of Hudson's Bay spruce is found in considerable quantities all along the coast.

PRINCE OF WALES SOUND—HUDSON'S STRAITS.

FAUNA AND FLORA.

The fauna and flora observed by F. F. Payne, assistant in the meteorological service of Canada, when he was in charge of the Stupart's Bay station, on the north-west coast of the Sound, are fully described in Lieut. Gordon's report of 1886.

According to a list given in this report respecting the flora, the plants are in bud at dates varying from the 20th of May to the 27th of June. They are in leaf generally in the course of June and in flower during July. The seeds ripen in August, and the plants wither between the 20th of August and the 15th of September.

GEOLOGY OF HUDSON'S BAY AND STRAITS.

The shores along the Straits consist chiefly of gneiss. The specimens of rock collected on the west coast of the Bay indicate that the Huronian series covers a large extent of the Hudson's Bay region; this series is the principal repository of the economic materials.

ECONOMIC MINERALS OF THE HUDSON'S BAY TERRITORIES IN GENERAL.

Dr. Bell in his report of 1885, enumerates the following useful minerals, describing the location where they are to be found :—

Iron, clay-ironstone, copper, lead, zinc, molybdenum, silver, gold, gypsum, salt, soapstone, lignite, anthracite, petroleum and asphalt, mica, graphite, asbestos, chromic iron, apatite, iron pyrites, lime, hydraulic cement, building stones, glass-sand, fire-clays and clays for brick-making, moulding-sand, shell-marl for manure, ochre, peat, flagstones, roofing slates and other substances, as well as various ornamental stones and rare minerals of scientific interest.

Judging from the information obtained and his researches up to 1887, he regards the north-west of Hudson's Bay as one of the most promising in valuable economic materials of the yet unexplored territories. See Lieut. Gordon's reports on his expeditions to Hudson's Bay, 1884–1885–1886.

LA BICHE LAKE.

Mean latitude, $54^{\circ} 48'$ north. Mean longitude, 112° . Nearly 24 miles long; lies in a shallow alluvial basin, and is surrounded by good land of a nearly level character; it discharges into the Athabasca.

It is 70 miles east by water and 40 in a direct line from Athabasca Landing.

It is in the Diocese of the R. R. Bishop Grandin, and is the residence of the Right Reverend H. J. Faraud, Bishop of the Vicariate Apostolic of Athabasca Mackenzie, Bishop of Anemour, consecrated 30th November, 1863. His Auxiliary, Mgr. Isidore Clut, up to 1889, resided at Fort Providence, near lower end of Great Slave Lake.

The Roman Catholic Mission of Notre-Dame des Victoires at this post, comprises St. Joseph's Academy, with about 30 pupils.

The Sisters of Charity have a convent there and also an Orphan Asylum, and a Hospital.

The Half-breeds and Indians raise a good amount of wheat and other cereals, together with potatoes and other vegetables. Wheat seldom suffers there from frost.

Nearly 1,000 Half-breeds and 500 Cree Indians are living around the Lake or in its vicinity.

The Methodists have an important Cree Mission at 40 miles south of this Lake.

In the Mackenzie Basin there are about 20,000 Indians in all, between its source and the Arctic Sea.

LIARD RIVER.

This affluent of the Mackenzie is navigable from its outlet at Fort Simpson for 240 miles, southward and westward towards the Rocky Mountains.

It freezes over about the 15th of October.

The breaking up of the ice on this stream, from 1876 to 1886, inclusive, has varied from the 5th to 27th of May.

The river is always open some time before the ice leaves Great Slave Lake.

Frost penetrates the ground about 4 feet.

Winds are frequent during the winter season, in the vicinity of the Fort aux Liards.

LITTLE SLAVE LAKE.

Lat., $55\frac{1}{2}^{\circ}$ to $55\frac{1}{2}^{\circ}$ N. Long., $114\frac{3}{4}$ to $116\frac{1}{4}$ W.

Elevation above the sea, 1,800 feet.

Greatest length, 65 Statute miles.

Greatest breadth, 12 Statute miles.

General breadth, 4 to 8.5 Statute miles.

Area, about 500 square miles.

R.C. Mission of St. Bernard, at west end of lake and upon its north side, under the Rev. D. Collignon, Supr., and Rev. Desmarais, O.M.I., in the Diocese of Mgr. Vital Grandin.

R.C. Indian School—45 pupils (Crees) descendants of the Algonquin Tribes—under the same missionaries.

Anglican Mission and three Protestant ministers, in the Diocese of Bishop R. Young.

Hudson's Bay Company's Post.

Mean temperature in summer, $+54^{\circ}$ F.

Barley has been found in stack here as early as the 12th of August.

FORT McLEOD—NORTH.

WEST OF THE ROCKY MOUNTAINS.

Lat., 55° N. Long., 123° , $15'$ W., per Map, Dept. Int., 1887.

One of the first posts of the Hudson's Bay was established here in 1805, at the foot of Trout Lake, now McLeod Lake, which discharges into the Parsnip River, a branch of Peace River, on the route followed by Sir Alexander Mackenzie across the Rocky Mountains to the Pacific Ocean in 1793, *viâ* Salmon River.

One branch of the Peace River takes its rise at the Fort where it is called the Parsnip. There is not a rapid in the river from Finlay Forks to McLeod.

FORT McLEOD—SOUTH.

On the Belly River, about 95 miles south-eastward from Calgary, and about 55 miles by trail north of United States Boundary.

Thence to Fort Shaw, U.S., 120 miles.

Lat. $49^{\circ} 45'$ N. ; Long. $113^{\circ} 25'$ W., per Map, Dept. Int.

The Indian population in the vicinity comprises about :

1,000 on the Piegan Reserve, south and west of Fort McLeod.

2,400 do Blood do east of do.

These Indians are attended to by the R.C. Missionaries:

Rev. A. Lacombe, O.M.I., of Fort McLeod.

L. VanTighen, O.M.I., of Lethbridge.

Emile Legal, O.M.I., of the Blood Reserve.

Donat Foisy, O.M.I., of Belly River.

There is an Anglican Mission here, under Rev. Mr. Hilton.

These Reserves and the Blackfeet Reserve of 2,150 Indians, which begin midway between Strathmore and Namaka or at 43 miles east from Calgary and end at Crowfoot at 75 miles from Calgary, and are along the south side of the Canadian Pacific Railway, are all in the R.C. Diocese of Mgr. Grandin and in the Anglican Diocese of Bishop W. C. Pinkham.

The Blackfeet Indians are attended to by the Rev. Léon Doucet, O.M.I., and by the Rev. Mr. Tims of the Church of England.

FORT McMURRAY LANDING.

Junction of Rivers Athabasca and Clearwater at about 225 miles north of Edmonton and 160 miles north-west from Lac à la Crosse, H. B. C. post.

Lat. $56^{\circ} 40' N.$; Long. $111^{\circ} 30'$, per map, Dep. Int.

Indian population in the vicinity of this fort, 150 per Rev. Grouard, O.M.I., 1888.

R. C. Mission—Notre Dame des Sept Douleurs—Rev. A. H. De Chambreuil, in the Diocese of Mgr. H. J. Faraud, O.M.I.

This fort is at the foot of a long series of rapids on the Athabasca River.

From 1878 to 1888 inclusive, the river was closed by ice between 24th October and 14th November; there was drifting ice in it from 18th October to 14th November; the ice broke up between 9th April and 4th May.

Specimens of wheat and barley have been obtained here which have astonished every one who saw them. Many of the ears contained 100 grains and the weight of both wheat and barley was nearly 10 per cent. over the ordinary weight. Further west, there is a vast country which Sir George Simpson, one of the Governors of the Hudson's Bay Company, calls the very Eden of the North.

Rye, oats, potatoes, turnips, strawberries and gooseberries grow here with facility.

Grain sown about the 10th May, is reaped about the 10th of August.

FORT McPHERSON.

Lat. about $67^{\circ} 26' N.$; Long. $134^{\circ} 57' W.$ (See W. Ogilvie's Report., Dep. Int., 1888-1889.)

This fort is built on the east bank of the Peel River, some 14 miles above the point where it divides and joins the Mackenzie delta which is common to both, at about 32 miles from the fort.

This is the most northerly point at which any one is permanently settled in this district.

A Roman Catholic Mission is to be established here in 1890-1891 by Bishop Isidore Clut. Archdeacon McDonald, formerly stationed at Fort Yukon and afterwards at Rampart House, had charge of the Anglican Mission work at this station in 1887.

	June 20 to 30.	July 1 to 31.	
Mean temperature.....	+ 62.0	+ 64.7	in 1888
Highest do	+ 74.0	+ 78.0	do
Lowest do	+ 37.3	.....	do
Mean minimum temperature.....	+ 43.33	+ 45.4	do

May. June. July. Aug.

Total hours of sunlight... 706 720 684 527=2,637—Ft. McPherson.

do do ... 456 462 464 423=1,808—Ottawa.

The soil, as seen along the Mackenzie, is good for agricultural purposes.

When W. Ogilvie, D.L.S., arrived at Fort McPherson on 20th June, the new buds on the trees were just perceptible, and on the evening of the 22nd, the trees were almost fully in leaf.

The combination of favorable temperature and long hours of sunlight, he states, promises well for vegetable growth, but there are interfering causes.

9—11**

Unfortunately snow storms are apt to come at any time in the year. On 2nd July five inches of snow fell and the thermometer went down to 25° (7° below freezing point), yet, strange to say, the frost did not appear to hurt anything.

No attempt at cultivating cereals or roots has been made as yet, it appears, although scarcely more than one degree further north than Fort Good Hope.

White population, Fort McPherson, including La Pierre's House at head of the Porcupine, 38.

Indian population in the vicinity of Fort McPherson, 351.

Esquimaux frequenting this fort, 350.

MISTASSINI LAKE.

Between 50½° and 51½° Lat. N., and between 72½° and 74° Long. W., at about 150 miles N.-W. from Lake St. John.

West portion of lake about 92 miles in length, and from 13 to 17 miles in breadth with a range of islands along the centre; east portion of lake about 60 miles in length, and from 5 to 10 miles in breadth. Area, as scaled on map, about 2,000 miles. It discharges westward through the River Rupert, about 213 miles in length, into James' Bay near the south-eastern end of James' Bay. This river is said to be much larger than the Saguenay.

Richardson, in his report of 1870, states that the land in the region of the Great Lake is a level plain not more than 30 feet above the lake, and that the soil, which is calcareous, is fertile and excellent for cultivation.

Blackberries were ripe 5th and 6th July; raspberries, 7th and 8th July; timothy was 2 feet high and coarse grass was 4 feet high on 9th July. He saw quantities of wild grapes in the surrounding country.

MOOSE FACTORY.

Say Lat. 51° 10' N., Long. 80° 45' W.

At head or southern end and west side of James' Bay, which forms part of Hudson's Bay.

Projected railway from Moose Factory to Lake Abitibi, Lake Temiskaming and to North Bay of Lake Nipissing, 350 miles in length. Company chartered in 1884 for its construction. See details of Lake Abitibi.

Mean temperature, June, July, August..... +62·20

do January, February, December..... —12·00

do entire year. +35·76

Highest temperature, June..... +52·10

Lowest do January..... —35·90

Rain fell 100 days. Rainfall in inches, 21·0 in 1878.

Snow fell 83 days. Snowfall in inches, 15·4 in 1878.

Percentage of cloudy days during twelve months 66·0.

First rain, 1877 to 1881, varied from 9th March to 4th April.

First snow do 16th to 21st October.

River frozen over do 2nd November to 9th December.

River open do 9th May.

Thunder and lightning, April, June, July.

Depth of snow in woods, varied from 10 to 30 inches, February and December.

Average summer temperature, 62°·20.

Turnips, beets, carrots, cabbages, onions, tomatoes, spinach, potatoes, mustard, cress, rhubarb, radishes and cauliflowers are raised here in abundance. The cauliflower appears to be one of the surest crops, and is sometimes ready for the table as early as the first of August. Vegetables are sown about 18th May, and potatoes planted towards 21st May.

Barley, oats, beans, pease and rye ripen well. The crops of the Windsor bean and Kidney bean are surprising.

Fall wheat grows very well, notwithstanding the severity of the winter frosts.

Eighty heads of cattle, besides horses, pigs and sheep, are kept here by the Hudson's Bay establishment.

Whether viewed in reference to size, quantity or quality the crops at Moose Factory and Matawagaming, 260 miles further south, will compare favourably with those in the best potatoe-growing districts in Ontario.

The Anglican Bishop, J. Horden, whose diocese of Moosonee embraces the territory around Hudson's Bay, resides at Moose Factory.

The Roman Catholic missions, east and west of James' Bay from 70° to 91° of longitude, are in the Vicariate Apostolic of Mgr. Lorrain who resides at Pembroke. The Rev. J. M. Nédélec, O.M.I., one of his missionaries, visits the Factory occasionally after attending the mission of Lake Abitibi. He resides at Mattawa.

There are 250 Protestant and many Catholic Indians at Moose Factory.

Wild animals and feathered game abound in the surrounding region.

FORT NELSON.

On east branch of River aux Liards, Rocky Mountains.

Lat. 58° 30' N.; Long. about 120° W.

R. C. Mission, Notre Dame des Neiges. Vicariate Apostolic of Mgr. H. J. Faraul.

Rev. Gourdon, O.M.I.

LAKE NIPIGON.

Lat. 49° 30' to 50° 15' N; Long. 88° to 89° nearly, W.

Distance by Nipigon River to Lake Superior about 30 miles.

Length about 60 miles, north and south.

Breadth about 40 miles, east and west.

Depth—No bottom found at 540 feet.

The lake comprises numerous islands; its waters are deep and contain, in abundance, fish of every description taken in Lake Superior.

The land is good on the south-western side of the lake, and the country becomes more level, receding from the lake and in the direction towards Winnipeg.

The country north of the hilly region around Lake Superior, between the Pic River and Lake Nipigon, is comparatively level, with a sandy soil, generally dry, but in places there are shallow swamps and low rocky ridges. The sand soil is underlaid by a light coloured clay which occasionally comes to the surface.

Oats and barley are successfully cultivated at Long Lake House, eastward of Lake Nipigon; hay, potatoes and all the ordinary vegetables thrive remarkably well. Potatoe tops are not touched by frost before the first week of October.

Climate:—At Pic the mean temperature recorded was 62·88 in July; 63·54 in August; 64·19 in September and 56·02 in October; weather very fine during these months. The temperature was nearly the same as at Toronto during July and August, and warmer in September and October, taking the average of 29 years, and although Toronto is about five degrees further south.

LAKE NIPISSING.

Lat. 46° 7' to 46° 23' N.; Long. 79° 30' to 80° 6' W.

Greatest length, east and west, about 40 miles.

Greatest breadth, north and south, about 20 miles.

Area about 500 square miles.

Elevation above the sea 665 feet.

The northerly shores of the lake are low, generally of flat rock and sand and the water shoal upon a sandy bottom.

Its waters pass out into French River by three outlets through myriads of islands, and are discharged into Georgian Bay, Lake Huron, which is 578 feet above the sea.

From Lake Nipissing to Georgian Bay the distance is about 40 miles, and the navigation is obstructed by falls and rapids. The scenery along French River surpasses that of the Thousand Islands of the St. Lawrence below Kingston.

FORT NORMAN (NEW).

On the Mackenzie River, 314 miles north of Fort Simpson, 169 south of New Fort Good Hope, 289 south of Old Fort, and 380 south of Fort McPherson.

Old Fort, latitude, 64° 40' 38" N.; longitude, 124° 44' 47" W., per Franklin, 7th June, 1826; variation, 39° 57' 52".

New Fort, latitude, 64° 54' 3"; longitude, 125° 43' 1"—Ogilvie, 1885.

Elevation of the Mackenzie at Fort Norman above the Polar Sea, about 150 feet.

New Fort Norman is situated on the east bank of the Mackenzie, just above the outlet of Great Bear Lake River.

On 5th July, 1789. Alex. Mackenzie passed here on his journey down to the Polar Sea. Franklin reached this point 7th August, 1825, and 25th June, 1826, going down the River Mackenzie.

In 1844 the old fort was situated 23 miles above its present site and on the west bank of the Mackenzie.

Mean summer temperature, June, July, August, + 59·87 at new fort.

The white population here amounts to about 9 persons, and the Indian population in the vicinity to about 254 persons.

There is an Anglican Mission here, in the Diocese of Bishop W. C. Bompas, and also the Roman Catholic Mission of Ste. Thérèse, which is under the Rev. X. C. Ducôt, O.M.I., who has resided upwards of 22 years at the post, in the Vicariate Apostolic of Mgr. H. J. Faraud.

W. Ogilvie, D.L.S., who stopped there in 1888, states in his report of 16th July, 1889:—

At Fort Norman the Hudson's Bay Company had a garden planted with turnips, potatoes and other garden produce. I was at that point during the last days of July, at which time potatoes were about six inches high and did not promise a good yield.

The Roman Catholic Mission had two patches, together about an acre in extent, planted with potatoes. The soil here was much better than in the first patch, being a warm clay loam, while in the other it was nearly all decaying vegetable, commonly called "muck." The mission potatoes were much stronger in the vines than the Hudson's Bay Company's, and at that time nearly covered the ground.

The Anglican missionary had planted a small piece of ground near the river, on a sheltered bench below the top of the bank, and facing the south. Here the growth was much stronger than at either of the other places. Some barley had been sown in it and was well grown, the stalks averaging from two to two and a half feet high, and the heads being long and just beginning to fill. The growth of grass on this flat is luxuriant, and nettles grow as strong and large as any I have seen elsewhere. Near the edge of the woods, wild vetches grow as long and vigorous as they do near Edmonton.

1872 TO 1888, INCLUSIVE.

First snow at New Fort Norman, 23rd September to 15th October.

First ice formed on the Mackenzie, 5th October to 2nd November.

Navigation closed do 2nd November to 18th November.

Ice broke up do 9th May to 28th May.

NORWAY HOUSE.

At the north-east end of Lake Winnipeg.

Lat. $53^{\circ} 41' 38''$ N.; long. $98^{\circ} 1' 24''$ W.

About 130 miles westward of Oxford House and 345 miles westward of York Factory.

Malcolm McLeod, who was examined before the Schultz Committee in 1888, states that:—"There was plenty of ground for cultivation, but that everyone was so busy at more urgent work that no one tried to farm or to cultivate."

Col. Crofton states that:—"Corn, pease, rhubarb, cabbages and other vegetables were grown successfully at this station when he was there."

OXFORD HOUSE.

On the Hayes and Hill River route from York Factory to Lake Winnipeg, 215 miles westward from York Factory, Hudson's Bay; 130 miles eastward from Norway House, at north end or foot of Lake Winnipeg.

Lat. $54^{\circ} 53'$ N.; long. $95^{\circ} 45'$ W., per map, Dep. Int., 1887.

Malcolm McLeod stated before the Schultz Committee, in 1888, that although this station is on the summit of the Laurentian range, he saw a fine garden, growing potatoes abundantly.

Barley and vegetables are grown here and much farther north in the Mackenzie River region.

PEACE RIVER.

This affluent of the Mackenzie stretches from beyond Fort McLeod, west of the Rocky Mountains, down to Great Slave River, below Fort Chipewyan of Lake Athabasca, or from Long. 123° and Lat. $54\frac{1}{2}^{\circ}$ to Long. $111\frac{1}{2}^{\circ}$ and Lat. $58\frac{1}{2}^{\circ}$.

The upper Peace River is navigable for steamers drawing 3 to 4 feet of water; with some improvement at two points, a draught of 5 to 6 feet might be obtained. It affords a navigable stretch of 557 miles down to the falls, some 50 miles below Fort Vermillion. The lower portion of the river is navigable for about 220 miles from the falls down to Lake Athabasca, excepting a rapid of about 2 miles in length.

This stream was the route selected by Mackenzie during his journey across the Rocky Mountains to the Pacific Ocean in 1793.

Peace River Landing is about 63 miles by trail or waggon road north-eastward from the west end of Little Slave Lake.

Before a Select Committee of the Senate, in 1888, Prof. Macoun said:—
 “The waters of the Peace River are like those of the Mississippi, of a milky colour. It is a mighty river, 1,000 yards wide. * * * * *
 When we reached the bank of the river, we came upon it like as if we were walking across this room; there was no appearance of a river at all. The country was perfectly level and there was no appearance of the river until we came upon the verge almost of a steep bank—we could see the country on the opposite side of the river. Seven hundred feet below us there wound a mighty river: I have never seen a river like it in any sense. You can picture to yourself a river 800 yards wide, meandering through a narrow but very deep valley, because we were 700 feet above the water of the river. We could look to the left up the Smoky River and to the right to the sandstone cliffs, miles below us. That was in September, 1872.

PEACE RIVER REGION.

This is a vast tract of fertile land embracing about 10 degrees of latitude and 13 of longitude.

It is a terraced land of rich rolling prairie, a park-like land of wood, glade and meadow where the jumping deer glance through the dry grass and trees.

The trees are of great size and of splendid growth; they are like the magnificent trees around Kensington Park.

The country is so crowded with animals that it has the appearance, in some places, of a stall yard.

On the Upper Peace River the snow fall is from 18 to 36 inches in depth; the snow disappears towards the 5th of April, and anemones blossom towards the 20th, at which time mosquitoes begin to appear.

The climate is mild owing to the influence of the Japan Sea, the great gulf stream of the Pacific, which tempers it to such an extent that wheat may be grown at Fort Simpson in Lat. $61^{\circ} 52'$, and barley as far north as Fort Norman in Lat. $64^{\circ} 54' 3''$, although it is 1,200 miles further north than Quebec.

The general level of the portion of the river between the Rocky Mountains and Smoky River is about 2,000 feet above the sea.

Between Peace River and Athabasca Lake, the elevation does not exceed 1,000 feet; it diminishes northward.

According to Capt. Palisser, the temperature lowers three degrees for every 1,000 feet of elevation above the sea.

PEEL RIVER.

This stream joins the Mackenzie below Fort McPherson, on its west side; it is navigable and navigated a distance of about 60 miles by the Hudson's Bay steamer "Wrigley," which ascends it with supplies and returns with the furs collected at the fort.

At the fort, the river is seldom clear of ice before the month of June.

PRINCE ALBERT

Is on the north side of the North Saskatchewan River, at 353 miles west of Lake Winnipeg and 460 miles east of Edmonton.

Latitude, $53^{\circ} 10'$ north. Longitude, $105^{\circ} 40'$ west, per map, Department Interior.

Population, say 5,000

Spring begins generally in April; harvesting is done from the second week of August until the first week of September.

Early frost comes about 17th August and the latest about 1st September.

Cattle must be fed as a rule from the time the heavy snow falls in November until March.

Wheat, oats, pease, barley, potatoes, carrots, parsnips and other vegetables are generally raised with success. Oats have yielded from 50 to 60 bushels per acre.

Strawberries, raspberries, cranberries, saskatoon and other berries are found in abundance.

North of Prince Albert there is an extensive belt of spruce and poplar.

FORT PROVIDENCE (NEW).

Latitude, about $61^{\circ} 30'$ north. Longitude, about $117^{\circ} 12'$, per map, Deville.

167 miles westward from Fort Resolution on south side of Great Slave Lake.

$157\frac{1}{2}$ miles south-eastward of Fort Simpson on the Mackenzie.

This Fort is 17 miles below Beaver Lake and 24 miles above Little Lake, or at 46 miles below west end of Great Slave Lake.

It is on the north bank of the river, some 15 to 25 feet above the water, and opposite an island a mile or more in length and half-a mile from the shore; the main channel is on the south side of this island; south of this island there is another island.

The Hudson's Bay Company have a trading post here, comprising various buildings.

Up to 1890 this station has been the headquarters of the Roman Catholic Bishop Clut, who has built a church, hospital, orphan asylum and a school, which are under the care of Rev. A. L. Lecorre and Audenard, O.M.I., and of eight Grey Nuns who now have 46 pupils.

White population at this post, about 42; Indian population in its vicinity, not increased since census of 1881, which gave 456.

W. Ogilvie in his report 16th July, 1889, to Department of Interior, states :—

At Fort Providence the usual garden produce is grown every year and generally turns out well. Barley is also grown with success; but in 1888 it was, as everywhere else in the valley, much retarded by cool weather. Up to my departure from the post, the lowest temperature, exclusive of 2nd July, was 31.8° on 29th August. The mean minimum for August was -43° . When I was there the barley was beginning to change colour, and unless a very severe frost came soon after, would ripen. Wheat has been grown here for many years by the Hudson's Bay Company, generally being fairly ripe before it is touched by frost, and sometimes escaping altogether.

FORT RAE.

Polar Station of Great Britain and Canada.

Lat. $62^{\circ} 39' N.$; Long. $115^{\circ} 44' W.$

Towards north end of north arm of Great Slave Lake.

Roman Catholic Mission of St. Michel, in the Vicariate Apostolic of Mgr. H. J. Faraud.

Rev. Bruno Roure and Victor F. Ladet, O.M.I.

According to last census, 1881, the white population comprised 8 men, 4 women, 8 boys and 6 girls, in all 26. The Indian population comprised 128 men, 147 women, 188 boys, 152 girls, in all 615.

Mr. W. Ogilvie in his report, 16th July, 1889, to the Department of the Interior, states :—

I was informed that small potatoes were grown in a garden at Fort Rae; but according to report there is not much land around the lake available for farming, even were the climate suitable, as it is nearly all rock.

Samples of seed were received from the Experimental Farm of Ottawa, but too late for planting in 1888.

Mean summer temperature—June, July, August, 55.53 .

Mean winter do December, January, February, -17.60 .

1.75 —Highest, August, $+85.00$,

1875 —Lowest, February, -51.00 .

1875 —Number of days rain fell, 11.

1875 —do snow fell, 44. (None in June, July and August.

1875 —Number of inches rain, 4.13 .

1875 —do snow, 19.20 .

Snow falls about the 27th September; the lake freezes over about the middle of October; the snow begins to disappear in April; the trees show signs of budding about 16th May; the ice breaks up towards 3rd June, and the trees begin to lose their leaves towards the first September.

FORT RELIANCE.

On the Yukon River.

Lat. about $64^{\circ} 15'$; Long. about $140^{\circ} 30'$.

There is a flat here of some 1,500 acres. Messrs. Harper and McQuestion have lived there for some years; it appears they never made any agricultural experiments, believing that they would be futile.

FORT RESOLUTION.

Lat. $61^{\circ} 10' 26''$ N., Long. $113^{\circ} 45' 00''$ W., on 30th July, 1825, by Franklin.

Lat. $61^{\circ} 10.5'$ N., Long. $113^{\circ} 46.5'$ W., Capt. Lefroy, 1842-44.

Near the outlet of Slave River into Great Slave Lake.

Here the Hudson's Bay Company has the usual trading station buildings, and the Anglican Church Mission Society of the Diocese of Bishop W. C. Bompas, has a small mission.

The Roman Catholic Mission of St. Joseph, in the Vicariate Apostolic of Mgr. H. J. Faraud, is on an island in the lake some distance from the fort. It is under the Rev. L. F. Dupire, O.M.I.

Indian population in the vicinity, about 300.

June 19. Lake ice solid west of fort.

do 28. Many plants in flower.

July 2. Ice very solid in various places.

W. Ogilvie, in his report, 31st December, 1889, states :—

At Fort Resolution the Hudson's Bay Company were growing potatoes, turnips and barley. The first two were of good quality and size, but there would be no yield of the last. The Anglican missionary also had a garden, in which were potatoes, cabbages, cauliflowers, turnips, onions and pease, the latter still green on the 21st of September. The potatoes and cauliflowers were both good in size and flavour.

Samples of grain were received from the Experimental Farm of Ottawa, but too late for planting in 1888.

SASKATCHEWAN RIVER.

According to Capt. Palisser the altitude of the upper portion of the plain of the Saskatchewan River is 2,700 feet, and that of the lower portion 1,600 feet above the sea.

The temperature lowers 3 degrees for every 1,000 feet of elevation above the sea.

FORT SIMPSON.

Lat. 62.11° N.; long. $121^{\circ} 38'$ W., per Franklin, 5th August, 1825.

Lat. $61^{\circ} 52'$ N.; long. $121^{\circ} 25.2'$ W., per Capt. Lefroy, 1842-44.

Var., $37^{\circ} 42'$ E., per Franklin, 5th August, 1825.

Situated on an island just below the junction of the Mackenzie and Liard Rivers, at about 800 miles from the mouth of the Mackenzie, 158 miles north-westward of Fort Providence, 180 miles below Fort Liard, in an air line, and about 300 miles below the source of the Mackenzie.

Elevation of the Mackenzie at Fort Simpson, 241 feet above the Polar Sea at the mouth, and 150 feet below the level of Great Slave Lake.

This post comprises the headquarters of Hudson's Bay Company for the district, together with the Roman Catholic Mission of the Sacré Cœur, under Rev. P. Nouel de Kranqué, Vicariate Apostolic of Mgr. H. J. Faraud, and an Anglican Mission in the Diocese of Bishop W. C. Bompas.

White population at this station, about 39; Indians in vicinity, about 500.

Mean temperature, June, July, August..... + 55·37

do December, February, December. —14·70

Highest temperature during summer..... + 69·30

Days rain, 103; snow 10, during the year.

Hours of sunlight, 538 in May, 570 in June, 558 in July, 481 in August.

Total hours of sunlight at Fort Simpson, 2,147, May, June, July, August.

do do Ottawa, 1,805 do do

Around the fort, the timber, consisting generally of hemlock, poplar, birch and fir, is very large and is used for building purposes. The fort is built of squared timber.

Potatoes of the same size as in Ontario are grown in abundance, and supplies of them are sent by boat to Fort Good Hope, 484 miles further north on the Mackenzie.

Turnips, onions, lettuce and barley are also raised. On 24th August, 1888, Mr. Ogilvie says, they looked as good as the same kinds seen on the Ottawa market, although this post is 1,150 miles further north than Ottawa.

Strawberries blossom about 7th June.

Garden products are available in August.

Wheat has been tried, but with indifferent success.

Cows and oxen are kept here all winter, and fed on native grass.

There are large numbers of cariboo and moose deer and rabbits, silver fox, beaver, marten, lynx, and foxes of all kinds, geese and ducks, in the Simpson district.

The fish used there, are whitefish and trout, 5 to 12 pounds, from Great Slave Lake. A fish called "la loche," of 30 to 40 pounds, is caught, but is generally used to feed the dogs.

In winter the ice on the Mackenzie is fully 6 feet thick. It breaks up and descends from 1st to 14th of May. The river remains open until 17th to 30th November, previous to which drift ice descends from 11th October to 12th November.

Snow 2 to 3 feet deep in winter.

FORT SMITH.

On west side of Great Slave River.

Lat. about 60° N.; Long. about 112° 20' W.

116½ miles below Fort Chipewyan on Lake Athabasca; 190½ miles above Fort Resolution, on south side of Great Slave Lake; 1,273½ miles above Fort McPherson, on the lower Mackenzie.

Fort Smith is at the lower end of a cart road, along the west side, over which the outfits for the posts on the Mackenzie are hauled from the head to the foot of the rapids.

At this station the Hudson's Bay Company have a few buildings, and there is also a Roman Catholic Mission called St. Isidore by Mgr. Faraud, who gave it the name of his Auxiliary, Mgr. Isidore Clut; the Mission is under the Rev. A. Laity, O.M.I., assisted by a lay brother.

There are about 200 Indians in the vicinity of this post.

Large deposits of salt are reported on Great Salt River, some miles from the Fort. The salt is used all over the Peace, Athabasca and Mackenzie districts, and to the taste is pure. Mr. McConnell, of the Geological Survey, visited the deposits in the fall of 1887.

FORT SMOKE RIVER OR FORT BOUCANE.

About 5 miles above junction of Peace River, or 7 above Peace River Landing, which is 63 miles by trail north-westward from west end of Little Slave Lake.

Landing, Lat. $56^{\circ} 15' N.$; Long. $117^{\circ} 16' W.$

Mission, Lat. $56^{\circ} 10' N.$; Long. $117^{\circ} 23' W.$

The R. C. Mission at this station is attended to by the missionaries in charge of the St. Charles Mission:—Rev. Aug. Husson and Desmarais under Mgr. Faraud and Mgr. Clut, his Auxiliary.

The soil along the road between Little Slave Lake and the mouth of Smoking River is of a superior quality. On the borders of the Peace and Liard Rivers there are several magnificent sections of good alluvial lands.

For details respecting land, trees, climate, etc., see Peace River District.

NOTE.—See "Lake Ste. Anne Mission" in Addenda.

FORT ST. JOHN.

On Peace River, near east side of Rocky Mountains, beyond south-west corner of Athabasca District, 95 miles west of Fort Dunvegan and 125 miles west of Hudson's Hope.

Lat. about $56\frac{1}{4}^{\circ} N.$; Long. about $121^{\circ} W.$

Professor Macoun states that potatoes, oats, barley and many varieties of vegetables were in a very flourishing state in "Nigger Dan's" garden. The oats stood nearly five feet high, and the barley had made nearly an equal growth, on 26th July, 1875. The barley and oats were both ripe about the 12th August. Berries on the plateau ripen about a week later than near the river.

From 1866 to 1875 the ice on the Peace River broke up between the 15th and 26th of April. Towards the fall of the year, the ice begins to drift between the 31st October and the 10th of November.

Mr. Selwyn, referring to the journals of temperature, etc., kept at this station, has reported that the climate of the Peace River compares favourably with that of the Saskatchewan or of Montreal.

LAKE ST. JOHN REGION.

On the northern, north-eastern and western sides of Lake St. John there is a vast extent of alluvial soil of great depth and fertility. The soil on the south shore is not so fertile nor so deep as upon the north and west shores. As the lake is sheltered by mountains, the climate is comparatively mild, less subject to variation and more regular than in the rest of the Province of Quebec, as established by meteorological observations. (*See comparative statement of thermometrical observations made and altitudes above the sea level measured during J. Richardson's exploration of 1870, at pages 358, 359, Gen. Rep. P. W., 1867-82.*)

Heat and rain are not so excessive as in the greater part of the district of Quebec.

The climate is as mild as that of Montreal, and is highly favourable for the culture of all sorts of grain and vegetables, including fall wheat, beets and turnips, and is especially adapted for the raising of horned cattle, sheep and pigs.

Spring begins two to three weeks earlier than at Quebec, and the soil is ready for the cultivation of vegetables before the lake ice disappears.

Ice begins to form in November, and the lake is afterwards frozen over so that it can be travelled on with safety, with heavy loads, after the 10th of December. Ice begins to disappear along the borders of the lake towards the middle of April. The whole of the lake is free from ice towards the 12th of May. The bed of the lake consists of limestone which crops out on its western shore. The dimensions, elevation and depth of the lake are :

	Miles.
Greatest length.....	28
do width	20
Contour	85
Area	365½

Elevation above the sea 278 feet, per report 8th March, 1881, of A. L. Light, Ch. Eng. R., P.Q. (*The Lake surface rises about 20 feet in spring above its winter level.*)

Elevation above the sea 293 feet, per Richardson's report, June, 1870.

Depth of lake varies generally from 3 feet at one mile from shore to 12 and 54 feet at 1½ to 3 miles from shore, and to 60 feet and more towards the middle of the lake, where the greatest depth varies from 60 to 225 feet.

The entire territory yet to be colonized and developed by means of railway and steamboat communication, in the St. Maurice, Quebec, Saguenay and Lake St. John regions, contains as much cultivable land as that now occupied in the two Provinces of New Brunswick and Nova Scotia.

ST. MAURICE, QUEBEC AND SAGUENAY REGIONS.

In the immediate vicinity of the railway there are 6 millions of acres, of which at least one-half is reported as being well adapted for settlement.

Between the St. Maurice and the Saguenay the extent of territory to be settled and developed is estimated at 28 millions of acres.

The settlement of the country along the main line of railway from Quebec to Lake St. John and the branch line to St. Tite on the Canadian Pacific branch of railway from Three Rivers to the Grandes Piles, on the St. Maurice, is progressing rapidly since 1882-83.

N.B.—For a full description of the Lake St. John and Saguenay regions, as regards climate, soil, minerals, forests, products, &c., see App. No. 8, by G. F. Baillairgé, D. M. P. W., pp. 344 to 446 of Gen. Rep., P. W., 1867-82. See also report of A. L. Light, Chf. Eng. Gov. Rys., P.Q., 9th March, 1881, in answer to an Order of the House of Commons, 14th Feb., 1881.

TEMISKAMING LAKE.

Between latitudes 46° 45' and 47° 40', and longitudes 79° and 79° 40', consists of three lakes, the lower, middle and upper, connected by narrow straits, and extends 75 miles, without any obstructions to vessels of the largest tonnage. The upper lake extends from Fort Temiskaming to the head, and is from 6 to 8 miles in width ; it is studded with picturesque islands.

The south end of the lower lake is about 40 miles north-eastward of North Bay, at north or upper end of Lake Nipissing.

The projected railway from North Bay to Moose Factory, 350 miles in length, is to connect with Lakes Temiskaming and Abitibi.

Area of Lake Temiskaming, per Deville, 113 square miles.

Elevation above the waters of the St. Lawrence or of the sea, at Three Rivers, which is the highest point affected to any extent by the action of the tides, 612 feet.

The influence of the tide at Sorel, further up the St. Lawrence, as recorded by G. F. Baillairgé during his examination of the dredged channel between Montreal and Quebec, varied from one to two inches, 1868 and 1869.

Hudson's Bay Company's Post, latitude $47^{\circ} 19'$ north.

do do longitude $79^{\circ} 31'$ west.

Mean summer temperature, 1888.....June, July and August, $69^{\circ} \cdot 2$.

do winter doDecember, January and February, $17^{\circ} \cdot 6$.

Highest during the year 1888.....July and August, $67^{\circ} \cdot 33$.

Lowest doJanuary, $9^{\circ} \cdot 23$.

Days cloudy and rain during the year 1888.....72.

do snow do38.

In this region there is good clay soil along the flats of the rivers and creeks; generally, however, a sandy loam prevails.

There is a R. C. mission here, under the Rev. F. X. Thérien, sup., J. Guéguen, A. Mourier, and F. A. Fafard, O.M.I., of the Apostolic Vicariate of Pontiac, under Mgr. N. Z. Lorrain.

Barley, oats, rye, peas and beans, turnips, beets, carrots, cabbages, onions, tomatoes, &c., are grown with facility.

Indian corn is grown in more than one locality near the head of the lake, and is said to ripen well.

Trees.—White and red pine are scattered over the whole region between Lake Temiskaming and Lake Abitibi; they are abundant and of good quality on the slopes of the hills along the Height of Land, some are from 8 to 9 feet in circumference. White spruce, yellow birch and cedar, of good size, are abundant. Sugar maple is tolerably plentiful round the head of the lake, but is not seen further north. The same remark applies to swamp maple and white oak.

North of the limit of the sugar maple, the most abundant tree in the region beyond the lake, is aspen, after which comes canoe-birch, spruce, bank-sian pine and Canada balsam. Elm and ash grow occasionally on low flats, as far as Lake Abitibi.

Fishes in this lake and that of Tamagaming, west of it:—Bass, pickerel, pike, and salmon trout in abundance.

Flagging slabs of good quality and large dimensions are found on the west side of Lake Temiskaming, about 7 miles above the "Galère." Roofing slates are found 5 miles up the Montreal River, which discharges into the Middle Lake, on its west side.

Wild animals and feathered game are abundant in the region towards James' Bay.

FORT VERMILION.

On Peace River, which discharges into the Great Slave River, and also connects with Lake Athabasca.

Latitude, about 58° ; $25'$ longitude about 116° .

Elevation above the sea, about 1,000 feet.

About 320 miles north-east of Fort Dunvegan, on the Peace River.

About 284 miles westward of Fort Chipewyan, near foot of Lake Athabasca.

Temperature, highest, $+90^{\circ}$.

Roman Catholic mission of St. Henri and school for Indians, under Rev. C. H. Jousard, O.M.I., diocese of Bishop Faraud and Mgr. Clut, his coadjutor.

Anglican mission and school under Rev. Garrioch and E. J. Lawrence, Diocese of Bishop R. Young.

Indians in the vicinity of this Fort, about 300.

W. Ogilvie, in his report of 16th July, 1889, states:—

At Vermilion, along the river on the south side, there are about twelve to fourteen miles of prairie, with small poplar and scrub, which runs back from the river about three miles. The soil is good black loamy clay, loose and deep, with a gravelly clay subsoil.

Wheat and barley, turnips, potatoes, carrots and parsnips thrive well.

The Anglican mission school, for the teaching of the young in the district, has a farm attached, with about twenty acres under cultivation, under the management of E. J. Lawrence. Last year (1887) his crops of potatoes, barley and wheat were splendid; this year the frost almost destroyed everything.

Mr. Garrioch, in charge of the Anglican mission, also cultivates quite a large piece, from twenty-five to thirty acres, in connection with the mission. The Hudson's Bay Company has an extensive field, growing both roots and grain (wheat and barley); the Roman Catholic mission also cultivates some ground. Besides the above farms, several others were located, in 1887, by private parties, all of whom seem hopeful for the future.

In the winter of 1887, 27 Cree Indians, out of a Band of 30, died of starvation, and were eating each other near this station; they had no snowshoes, and could not therefore go out to hunt. The missionaries were unable to assist them; they receive nothing from the Government; from 20 to 25 per cent. of duty is collected on articles imported for the use of the settlers in that part of the country.

FORT WRIGLEY.

Lat. over 63° ; Long. about 123° .

On east side of the Mackenzie.

624.5 miles above Fort McPherson.

180.3 do do Norman.

134.0 miles below do Simpson.

The Mackenzie is $\frac{3}{4}$ of a mile wide for a short distance below and more than 1 mile wide above the Fort.

This post was formerly known as "The Little Rapid," but has received the name it now bears in honour of the present Chief Commissioner of the Hudson's Bay Company.

W. Ogilvie, in his report of 16th July, 1889, states:

"Some slight attempts at cultivation had been made, but I do not consider them a fair test of the capabilities of the place. When I was there on 15th August, 1888, the people were gathering blueberries, then fully ripe and as large and well flavoured as they are in Ontario. Ripe strawberries were found on 9th August 90 miles below this and a few raspberries soon afterwards. Above the Fort, wild gooseberries and black currants were found in abundance, some of the small islands being literally covered with the bushes. The goose-

berries were large and well flavoured, and the currants would compare favourably with the same fruit as cultivated in the vicinity of Ottawa, the black currants being especially large and mellow. This was in the middle of August, in latitude 63°. NOTE.—See "White Fish Lake" in Addenda.

YORK FACTORY.

On west side of Hudson's Bay and on a tongue of land between the Rivers Nelson and Hayes. Lat. 57° 0' 3"; Long. 92° 28'.—(Lieut. Gordon.)

The Church of England has a Mission here for the Indians, the number of whom has not been ascertained.

No R.C. Mission at this station.

Summer mean temperature..... + 58·17 in 1886—*Lieut. Gordon.*

Winter do —17·19 do do

Highest temperature..... + 68·30 July, 1882 do

Lowest do { —27·26 Jan., 1882 do
—52·00 certain years.

Number of days' rain in 1886, 44; inches of rain, 25·10.

do snow in 1886, 95; do snow, 70·10.

Hayes River opens 9th May to 1st June—1828 to 1890.

do closes 3rd Nov. to 9th Dec—1828 to 1890.

This river is the route followed by the H. B. Company's boats towards Norway House at the foot or north end of Lake Winnipeg.

Trout, salmon and a very fine species of whitefish are abundant in the Nelson and Hayes Rivers.

Nelson River freezes to a depth of 5·75 feet in Dec., Jan., Feb., March.

Hayes do do 6·50 do do

In April and May the soil is frozen to a depth of from 30 to 48 inches.

In June, July and August the thaw penetrates the ground from 10 to 40 inches, and sometimes more, according to locality.

A short distance in the country, the ground is not frozen in summer. It is completely thawed out; drove pole 6 feet in ground—no frost—*Dr. Bell*, 1880.

Snow seldom falls during the last three months of the year.

Potatoes are grown at this station every year; also turnips, radishes and plants.

For more than 200 years from two to five sailing vessels, on an average, frequently with war-ships conveying them, have sailed annually from Europe and American ports to Port Nelson (York Factory) and other ports on Hudson Bay, and returned with cargoes the same season.

The average date of 116 arrivals of the Hudson's Bay Company's ships at York Factory, is about 4th Sept. Of the 116 arrivals, 48 were in August, the earliest being on the 6th; the latest was on the 7th of October, on which occasion the vessel wintered in the bay.

Lieut. Gordon, in his report of 1886, states that the estuary of the Nelson River is one of the most dangerous places for vessels to go to, and that no expenditure of money can make it a desirable place for shipping.

His ship was lying 9 miles from the nearest land and 28 miles from the proposed terminus of the railway from Winnipeg and was yet but little more than a mile from the point of a shoal, with only 6 feet of water on it and a tide of nearly 3 knots.

For further details, see Hudson's Bay.

FORT YUKON.

In Alaska, United States Territory, at junction of Yukon and Porcupine Rivers.

Lat. $66^{\circ} 31' N.$; Long. $145^{\circ} 20' W.$, per Map, Dept. Int., 1887.

Barley is grown at this station.

YUKON DISTRICT.

YUKON RIVER AND TRIBUTARIES.

From Chilkoot Pass, or Lake Bennett, to the Alaska boundary, west of Fort Reliance.

From Lat. 60° and Long. 135° to Lat. $65^{\circ} 15'$ and Long. 141°

Mr. W. Ogilvie, Dominion Land Surveyor, in his report of 16th July, 1889, describes the country traversed by him in the Yukon District and elsewhere in 1887.

After describing the country seen along his route, from the Chilkoot Pass to the boundary beyond Fort Reliance, he states :—

Without the discovery and development of large mineral wealth, it is not likely that the slender agricultural revenues of the region will ever attract attention, at least until the better parts of our Territories are crowded.

In the event of such discovery, some of the land might be used for the production of vegetables for the miners ; but even in that case, with the transport facilities which the district commands, it is very doubtful if it could compete profitably with the south and east.

The Yukon has a course of 2,200 miles from its source to the ocean.

The river is not generally clear of ice until between the 25th of May and the 1st of June, and heavy frosts occur early in September, and sometimes earlier.

At the boundary, 687.55 miles from Haines Mission, Chilkoot Inlet, there are two flats of several hundreds of acres each ; one on the west side, the other three miles above it, on the east side. Both of these are covered with poplar, spruce and white birch, also, with some willows and some small pine.

In making preparations for the foundation of our house at our winter quarters near the boundary, we had to excavate in the bank of the river, and in an exposed place, where the sun's rays would reach the surface without hindrance from trees or other shade, we found the depth to the perpetually frozen ground to be not more than two feet. In the woods where the ground is covered with over a foot of moss, the frozen ground is immediately below the moss. On this the timber is generally small and of very slow growth, as is evident from the number of annual rings of growth. I have seen trees of only three or four inches in diameter which were upwards of one hundred and fifty years old.

YUKON RIVER NAVIGATION.

From the mouth of the river on Behring Sea, across United States Territory, the distance to the International Boundary Line at 141° of west longitude is about 1,500 miles ; thence across Canadian Territory to the confluence of Lake Bennett, the distance is about 639.34 miles.

The confluence of the Yukon and Porcupine Rivers is about 200 miles N. W. from the International Boundary Line, according to Capt. C. W. Ray-

mond of the United States Corps of Engineers, who was there for some time in 1869. It is 412 feet above the sea, which gives a fall of 1.9 per mile on the 200 miles.

Three steamboats, the "Yukon," the "St. Michel" and the "Explorer," belonging to the Alaska Commercial and Fur Trading Company, navigate the river; they are small and carry little or no freight, but they tow loaded barges; the Company intended to put a larger boat, on the river in 1888, one that would carry 120 to 200 tons of freight and make 5 to 7 miles per hour up stream on the upper portion of the river, instead of the present stern-wheel boats which scarcely reach 3 or 4 miles an hour.

There is another steamer, the "New Rocket," which takes supplies to the Forty Mile River; she is about 40 feet long, 9 to 10 feet beam, with about 2 feet draught; she was 22 days out from St. Michel's Island near the mouth of the Yukon; she endeavoured to ascend the Stewart River with supplies for the miners but could not overcome the current.

YUKON DISTRICT.

FISH.

With the exception of a small species locally called the Arctic trout, fish are not numerous in the district.

On the way down, salmon were first seen twenty or twenty-five miles above Five Finger Rapids, 316.74 miles below Lake Bennett. After coming up the river Yukon for a distance of 2,000 miles from the sea, they are poor, and would not realize much on the market.

PLANTS.

A small collection of plants was made along the river, and those obtained above the Pelly, were taken home by Dr. Dawson of the Geological Survey. (*See Appendix of Ogilvie's Report*).

SNOW, ICE, ETC.

First snow of the season on the mountain tops, 10th Sept., 1887.

do in the valley, 23rd Sept., 1887.

Temperature of river water, +38° 1st Oct., 1887.

During winter, at the International Boundary Line, the temperature was as follows:—

	Mean Minimum at 7:30 a.m.	Mean Minimum at 1:30 p.m.
1887—October.....	+ 18.5	—
November.....	— 5.1	—
December.....	—33.6	—27.6
1888—January.....	—25.3	—15.3
February.....	—16.8	— 4.3

First ice drifting in river, on 21st Oct., 1887.

Ice set in river, on 15th Nov., 1887.

Thickness of ice, 14½ inches, on 1st Dec., 1887.

do 40½ do on 3rd Jan., 1888.

do 48 do on 3rd Feb. 1888.

do 48½ do on 2nd March, 1888.

YUKON DISTRICT.

ANIMALS.

The principal furs procured in the district are the silver-grey and black fox, the number of which bears a greater ratio to the number of red foxes than in any other part of the country. Marten and sable are numerous, also lynx; but otter are scarce, and beaver almost unknown.

Game is not now as abundant as before mining began, and it is difficult, in fact impossible, to get any close to the river. The Indians have to ascend the tributary streams to get anything worth going after.

On the uplands, vast herds of cariboo still wander, and when the Indians encounter a herd, they allow very few to escape, although they do not require the meat.

The mountain sheep (Big-horn) and mountain goats exist everywhere in the territory; they are seldom seen from the river.

BIRDS.

These are scarce. Some ravens, magpies and partridges were seen, together with a few white-headed eagles, and some owls.

Wild geese and ducks are plentiful in their season, and of ducks there are many more species than in any other part of the territory. Most of these were observed towards the head of the River Porcupine.

MINERALS.

A seam of coal was found on the Lewes River, about six miles above Five Finger Rapids. This seam is about three feet thick; the coal looks good. G. C. Hoffman describes it as a lignite coal. Dr. Dawson made an examination of this seam. Coal seams were also seen six miles below Five Finger Rapids and near Coal Creek, five miles below Forty-Mile River. Some of the seams measure five feet and one of them seven feet.

METALS.

Mr. Ogilvie states: It is probable that we have not less than 1,400 miles of stream in the Canadian part of the Yukon district, upon all of which gold can be found.

Stewart River is the first in the district on which mining to any extent has been done. I have heard the amount of gold found there in 1885-86 estimated at \$300,000. The highest amount of any one man's earnings was about \$6,000. This may be true, as many agree that \$30 per day per man was common on many of the bars on the Stewart River.

The quantity of gold found in 1885-86, by about forty miners, on the Forty Mile River, is estimated at from \$112,500 to \$130,000.

YUKON AND ATHABASCA DISTRICTS.

Freight Rates.

Messrs. Harper, McQuestion and Co., are the only persons who have been doing business in the country, apart from gold mining, since 1873. They occupied Fort Reliance for some years and afterwards established a trading post at Stewart River in 1886 on account of the miners who were working there. In 1887 they established a post at Forty-Mile River, whither nearly all the miners went when coarse gold had been found.

They do a sort of commission business for the Alaska Commercial and Fur Trading Company. Their freight charges are \$30 per ton for goods paid for in furs and \$125 per ton for goods paid for in cash, for the use of the miners.

The prices paid in 1887, were \$17.50 for flour per 100 lbs.; \$40 for bacon per 100; \$18 for beans per bushel; \$30 for sugar per 100; \$1.25 for tea per lb. Their sales during the season, amount to about \$60,000.

ATHABASCA DISTRICT.

From Calgary on the Canadian Pacific Railway to Edmonton on the North Saskatchewan, the distance by cart trail is about 196 miles, or 192 in a direct line. All the material brought into the northern district has to be freighted along this trail and the machinery for several steam mills has been hauled over it. The freight rates from Calgary to Edmonton are from one and a-half to three cents per pound, according to the state of the roads, and the necessities of the importers.

YUKON TERRITORY.

FROM Chilkoot Inlet at the head of Lynn Inlet on the Pacific Coast.

Distances from Haines Mission.	Miles.	Distances from Haines Mission.	Miles.
Haines Mission, Chilkoot Inlet at the head of Lynn Channel, to entrance of Taiya Inlet.....	4 79	Head of White Horse Rapids.....	145 07
Head of Taiya Inlet.....	20 12	Foot of White Horse Rapids.....	145 45
Head of canoe navigation, Taiya River.....	26 02	Tahk-heena River.....	160 04
Forks of Taiya River.....	28 50	Head of Lake Labarge.....	173 19
Summit of Taiya Pass.....	34 88	Foot of Lake Labarge.....	204 34
Landing at Lake Lyndeman.....	43 18	Tes-lin-too River (Newberry of Schwatka).....	236 00
Foot of Lake Lyndeman.....	47 61	Big Salmon River of miners (D'Abbadie of Schwatka).....	269 45
Head of Lake Bennett.....	48 21	Little Salmon River of miners (Daly of Schwatka).....	305 66
Boundary line B. C. and N. W. T. (Lat. 60°).....	58 21	Five Finger Rapids (Rink Rapids of Schwatka).....	364 95
Foot of Lake Bennett.....	73 97	Pelly River.....	423 41
Foot of Cariboo Crossing (Lak Nares of Schwatka).....	76 56	White River.....	519 23
Foot of Tagish Lake.....	93 37	Stewart River.....	529 03
Head of Marsh Lake.....	98 27	Fort Reliance.....	602 32
Foot of Marsh Lake.....	117 33	Forty-Mile River.....	647 20
Head of Cañon.....	143 06	Boundary line between Canada and Alaska, U. S., at 141° Long. W.....	687 55
Foot of Cañon.....	143 68		

(See Report of William Ogilvie, D. L. S., 16th July, 1889, to Department of Interior, on his Exploratory Survey of part of the Lewes, Tat-on-Due, Porcupine, Bell, Trout, Peel and Mackenzie Rivers.)

YUKON TERRITORY.

FROM Fort McPherson, west of the Mackenzie, up to Fort Chipewyan, Lake Athabasca.

Distances from Fort McPherson.	Miles.	Distances from Fort McPherson.	Miles.
Mackenzie River proper	32.1	River between Two Mountains	628.0
Red River	60.1	Willow Lake River	667.0
A large river entering on the east side, name unknown	120.5	Ne-hauner River	683.3
Loon River	250.8	Fort Simpson	738.5
Hare Indian River	272.4	Head of Line	829.5
Fort Good Hope	274.7	Yellow Knife River	855.6
Ramparts	283.6	Little Lake	892.0
Beaver River	295.7	Fort Providence	916.0
Sans-Saut Rapids	322.7	Great Slave Lake	962.0
Mountain River	323.3	Hay River	997.0
Caracajou River	328.0	Buffalo River	1,024.0
Great Bear River	444.0	Buffalo Creek	1,071.0
Fort Norman	444.2	Fort Resolution	1,083.0
Gravel River	509.3	Fort Smith	1,273.5
Riv. le Vieux Grand Lac	550.5	Head of Rapids	1,287.5
Fort Wrigley	624.5	Peace River	1,358.9
		Fort Chipewyan	1,390.0

(See Report of W. Ogilvie, 16th July, 1889.)

YUKON DISTRICT.*

Proposed route to gold mines, at head waters of the Yukon River, and to the Cassiar Mines, B.C. :—

	Miles.
Waggon road, Edmonton to head of Pelly River.....	840
Edmonton to Athabasca Landing (road built)	90
Post, Lesser Slave Lake	160
Lesser Slave Lake to Peace River Landing (road built) ..	90
Peace River Landing to Fort Halket on the Liard.....	300
Fort Halket to Lake Frances, head of Pelly River....	200
	<u>840</u>

The cost going to the mines by the Coast, with two years' supplies, at least, \$400.

The cost by the proposed new route would be \$250.

By the coast route supplies must be purchased in Duncan or Sitka, in American territory.

The Pelly is navigable from Houle Rapids, 25 miles from Pelly Banks Post to junction of Porcupine River—1,000 miles without a break, while on the other hand the Lewis River, down which miners from the coast must travel, is broken by numerous rapids and three lakes, out of which the ice does not move until July.

The present cost of provisions on the Yukon, is :—

	Per 100 lbs.		Per 100 lbs.
Flour	\$10	Beans	\$25
Bacon	25	Apples	25

*See Report of Senator Schultz' Committee, 1888, p. 135.

PART VIII.

BOUNDARIES

BETWEEN CANADA AND THE UNITED STATES

AND OF THE

PROVINCES OF NOVA SCOTIA, NEW BRUNSWICK AND QUEBEC,
—OF THE LABRADOR COAST UNDER THE GOVERNMENT OF
NEWFOUNDLAND,—OF THE PROVINCES OF ONTARIO, MANI-
TOBA AND BRITISH COLUMBIA,

AND ALSO OF THE

PROVISIONAL DISTRICTS OF KEEWATIN, ASSINIBOIA, SASKAT-
CHEWAN, ALBERTA AND ATHABASCA.

AUTHORITY BY WHICH THE BOUNDARIES OF CANADA AND OF THE PROVINCES
AND PROVISIONAL DISTRICTS WERE FIXED.

CANADA.

Convention between Great Britain and the United States, 1818.

Decision of Commissioners under VI and VII Articles of the Treaty of Ghent, 1822.

Southern boundaries commencing from the East :—

Ashburton Treaty, 1842.

Washington Treaty, 1846.

Decision of the Emperor of Germany, 1872.

Nova Scotia.

Described by Bouchette.

New Brunswick.

Imperial Act, 14 and 15 Vic., cap. 63, 1851–52, and Ashburton Treaty, 1842.

Quebec and Labrador.

Southern boundary by 14 and 15 Vic., cap. 63, 1851–52, and Ashburton Treaty, 1842.

Western boundary by Governor General's Proclamation, November, 1791, and 23 Vic., cap. 21, 1860.

Northern boundary between Provinces and North-East Territories—disputed.

North-Eastern boundary between Province and North-East Coast of Labrador, under Government of Newfoundland, as described in Governor Bannerman's Commission, 10th August, 1863.

Ontario.

Southerly boundary by VI Article of the Treaty of Ghent, 24th December, 1814, and the decision of Commissioners appointed thereunder, 18th June, 1822.

Manitoba.

44 Vic., cap. 14, 1881.

British Columbia.

Paris Convention, 1825.

29 and 30 Vic., cap. 67, sec. 7, 1866–67; 47 Vic., cap. 14, Statutes B. C., 1884.

PROVISIONAL DISTRICTS.

Kewatin.

39 Viet., cap. 21, 1876. Proclamation, 7th May, 1886.

Assiniboia, Saskatchewan, Alberta, Athabasca.

Order in Council, 8th May, 1882.

DESCRIPTION OF BOUNDARIES.

CANADA.

By the Ashburton Treaty, 1842, it was agreed that the line of boundary should be as follows:—

Beginning at the monument at the source of the St. Croix, thence north following the exploring line run in 1817 and 1818 to its intersection with the River St. John; thence up the middle of the main channel of that river to the mouth of the River St. Francis; thence up the channel of the River St. Francis to the outlet of Lake Pohenagamook; thence south-westerly in a straight line to a point on the north-west branch of the River St. John which point shall be ten miles distant from the main branch of the St. John and seven miles from the summit of the highlands which divide the rivers which empty themselves into the River St. Lawrence from those which fall into the River St. John; thence in a straight line about south, 8 degrees west to the point where the parallel of latitude $46^{\circ} 25'$ north intersects the south-west branch of the St. John's; thence southerly by the said branch to the source thereof in the highlands at the Metgarmette Portage; thence down along the said highlands to the head of Hall's Stream; thence down the middle of said stream till the

ONTARIO.

Westerly, northerly and easterly boundaries, by Canada Act, (Ontario Boundary), passed by Imperial Parliament, 52-53 Vic., cap. 28, 12th August, 1889.

thence turning westerly and passing around the southern and westerly sides of said island keeping 100 yards distant therefrom and following the curvature of the shores to a point opposite the north-west corner or angle of said island; thence to and along the middle of the main river—as expressed in detail in the said decision—to the south of Grand or Long Island, keeping near its southern shore and passing to the north of Carlton Island until it arrives opposite to the south-western point of said Long Island in Lake Ontario; thence passing to the north of Grenadier, Fox, Stoney and the Gallops Islands in Lake Ontario, and to the south of the islands called “the Ducks” to the middle of the said lake; thence westerly along the middle of the said lake, to a point opposite the mouth of the Niagara River; thence to and up the middle of the said river—as described in said decision—to Lake Erie; thence southerly and westerly along the middle of Lake Erie in a direction to enter the passage immediately south of Middle Island; thence along the said passage proceeding to the north of Cunningham's Island and of the three Bass Islands and of the Western Sister and to the south of the Hen and Chickens and of the Eastern and Middle Sisters; thence to the middle of the Detroit River in a direction to enter the channel which divides

Bois-Blanc and Sugar Islands; thence up the said channel—as described in said decision—to Lake St. Clair; thence through the middle of said lake in a direction to enter the River St. Clair through the old ship channel; thence along the middle of said channel—as described in said decision—to Lake Huron; thence through the middle of Lake Huron in a direction to enter the strait or passage between Drummond's Island and the Little Manitou Island; thence through the middle of the passage; thence turning northerly and westerly around the eastern and northern shores of Drummond's Island—as more particularly described in said decision—until it strikes a line passing across the river at the head of St. Joseph's Island and at the foot of the Neebish Rapids.

The same Commissioners were authorized to determine the line from the water communication between Lake Huron and Lake Superior to the most north-western point of the Lake of the Woods.

By the Convention between Great Britain and the United States, signed at London, October 20, 1818, it was agreed that a line drawn from the most north-western point of the Lake of the Woods along the 49th parallel of north latitude, or, if the said point shall not be on the said parallel, then that a line drawn from the said point due north or south, as the case may be, until the said line shall intersect the said parallel, and from the point of such intersection due west along and with the said parallel, shall be the line of demarcation between the two countries from the Lake of the Woods to the Stoney Mountains.

By the Treaty signed at Washington, 15th June, 1846, the line of boundary was continued westward along the said 49th parallel of north latitude to the middle of the channel which separates the continent from Vancouver's Island; and thence southerly, through the middle of the said channel and of Fuca's Straits to the Pacific Ocean.

A difference of opinion having arisen between the two countries, a treaty was made at Washington, on 8th May, 1871, by which the matter was left to the Emperor of Germany.

On 21st October, 1872, he decided that the claim of the Government of the United States, viz:—that the line of boundary between the United States and Canada, should be run through the canal of Haro, as most in accordance with the Washington Treaty of 1846.

NOVA SCOTIA.

(Including Cape Breton.)

The Province is an extensive peninsula connected with the Continent of North America by a narrow isthmus of about 15 miles in width, between Bay Verte, in the Straits of Northumberland, and Cumberland Basin, at the eastern extremity of the Bay of Fundy. It is situate between $43^{\circ} 25'$ and 47° north latitude and $59^{\circ} 40'$ and $66^{\circ} 30'$ longitude west from Greenwich. It is bounded on the north-west by the Bay of Fundy and by the boundary line extending from Cumberland Basin, in Chignecto Bay, to the Bay Verte, which separates it from the County of Westmoreland in New Brunswick; on the north and west by the Gulf of St. Lawrence; and on the south, east and south-east by the Atlantic Ocean.

CAPE BRETON.

The Island of Cape Breton, which is separated from the mainland by the Gut of Canso, derived its name from the Basque fishermen who first gave it to eastern promontory of the island in remembrance of their old home near Bayonne. The Indian name was "Coonumahghee." It is about 110 miles long by 80 miles wide. After its capture on 26th July, 1758, it remained a separate province until 7th October, 1763, when it was annexed to Nova Scotia. It was again separated in 1784, and remained a separate province under the control of a Lieutenant-Governor and Council of Nine until the 9th October, 1820, when it was re-annexed.

Note.—See Brown's History of Cape Breton, 1862.

PRINCE EDWARD ISLAND.

Formerly called Ile St.-Jean under the French régime, is situated in the southern portion of the Gulf of St. Lawrence, and is bounded on the south by Northumberland Strait. It is 40 miles from Cape Breton Island, 15 miles from Nova Scotia and 9 miles from New Brunswick. The extreme length is 140 miles, the extreme width 34 miles, and the area is 2,000 square miles.

This island surrendered to the English under Lord Rollo in 1758; its name was changed to that of Prince Edward in 1799.

NOTE.—For further particulars see page 73.

NEW BRUNSWICK.

The boundary between New Brunswick and Canada was settled by the Imperial Act 14 and 15 Vic., cap. 63, in conformity with an award made by arbitrators appointed by the Governor General and Lieutenant Governor, as follows :—

On the west by the boundary of the United States as traced in 1842, from the source of the St. Croix to a point near the outlet of Lake Pech-la-wee-kaac-nies, or Lake Beau; thence by a straight line connecting that point with another point to be determined at the distance of one mile due south from the southernmost point of Long Lake; thence by a straight line drawn to the southernmost point of the Fief Madawaska and Témiscouata, and along the south-eastern boundary of those fiefs to the south-east angle of the same; thence by a meridional line northwards till it meets a line running east and west, and tangent to the height of land dividing the waters flowing into the River Rimouski from those tributary to the St. John; thence along this tangent line eastward until it meets another meridional line tangent to the height of land, dividing waters flowing into the River Rimouski from those flowing into the Restigouche River; thence along this meridional line to the 48th parallel of latitude; thence along that parallel to the Mistouche or Petapedia River, and thence down the centre of the stream of that river to the Restigouche; thence down the centre of the stream of the Restigouche to its mouth in the Bay of Chaleurs, and thence through the middle of that bay to the Gulf of St. Lawrence; the islands in the said Rivers Mistouche and Restigouche to the mouth of the latter river at Dalhousie being given to New Brunswick.

By the Treaty of 1842 (Ashburton Treaty), it was agreed that the line of boundary between New Brunswick and the United States should be as follows :—

Beginning at the monument at the source of the St. Croix; thence north following the exploring line run in 1817 and 1818 to its intersection with the River St. John; thence up the middle of the main channel of that river to the mouth of the River St. Francis; thence up the channel of the River St. Francis to the outlet of Lake Pohenagamook.

MEMORANDUM

RESPECTING

The Northern Boundary Line of the Province of Quebec,

ADDRESSED TO THE COMMITTEE OF THE LEGISLATIVE ASSEMBLY APPOINTED TO
ENQUIRE INTO THIS MATTER.

The Province of Ontario, as an integral part of this section of North America, formerly known as New France, lays claim to an extension of territory reaching northward to the southern shore of James' Bay. The superficies of the territory thus claimed is about one hundred and twelve thousand two hundred and forty square miles. The space lying between the meridian of the confluence of the Mississippi and the Ohio, and the line of separation between the waters of the St. Lawrence and those of Hudson's Bay towards the west (comprising about 6,000 miles) is not included within this superficies.

The Province of Quebec, forming also a part of what was once New France, owes it to herself to reclaim, as part of her heritage, a similar augmentation of territory, relying also, therefor, upon the pretensions and rights of the French Crown before the cession, the French having been admitted to be justly entitled, as first occupants, to the whole of the country of Canada, or New France, as far as the Arctic Circle.

It is not, however, upon such pretensions that the Governments of Ontario and Quebec may now rely, but upon the data and the facts discussed during the negotiations which took place between France and England respecting the positions to be held by their respective nationalities in America, at the time of the Treaty of Utrecht.

It appears from the result of the searches made by the Abbé Verreau at the Ministry of Foreign Affairs in Paris, (extract from the Utrecht negotiations respecting North America,—memorandum of Pontchartrain, 2nd January, 1712,—date of the Treaty of Utrecht, 1713)—that “the English envoys, on their maps, established the limits of Hudson's Bay by drawing a straight line from the coasts of Labrador to those of the Pacific. The French line deviated from this only from Cap Enchanté to the foot of Lake Nemisko, where it connected again with the first line. This concession is made in order to facilitate matters. But however these lines may be disposed and settled, it must be specified in the first case, that the line shall commence at the bottom of La Baie du Sud, shall strike immediately below and to the south of Lake Nemisko, and thence running west shall pass eight leagues above and to the north of Lac Supérieur des Sauvages Sioux. In the second case it will be necessary to specify, that the line shall commence twelve leagues above and to the north of Cap Enchanté, shall pass one league above and to the north of Lake Mistassini, and thence running west shall pass six leagues above and to the north of Lac Supérieur des Sauvages Sioux.”

It is well to remark that "*Lac Supérieur des Sauvages Sioux*" here referred to, cannot be the great "*Lake Superior*" properly so-called. This vast fresh water sea has never been named, on any map with which I am acquainted, "*Lake of the Sioux Indians*." It is named *Lake Superior*, *Lake Tracy*, *Grand Lake*, etc. On Ducreux's map of New France, 1660, inscribed in Latin, it is called "*Lacus Superior*";—on that of Franquelin, 1688, "*Lac Supérieur*." The "*Relations of the Jesuits*" say nothing else on this subject. But the *Lake of the Sioux Indians* is a distinct lake, clearly indicated on Franquelin's map, 1688, on which it is named "*Lac Buade*," or des "*Isatis*" or *Lake of the Sioux Nation*. It is designated in the same way on Mitchell's map, 1755; on the map of the United States, by Latre, 1784; and on that of North America by Herman Moll. See copies herewith.

The position of *Lake of the Sioux* corresponds nearly with that of "*Lac Seul*" on the maps of the present day. Then, if a line be drawn eight leagues north of this lake, running eastward, it should strike the head of *James' Bay*, pass by the foot and to the north of *Lake Nemisko*, and meet a line drawn from *Cape Grimmington*, a few miles north of *Lake Mistassini*. In this way, the two lines referred to in the preceding extract, although established according to the somewhat imperfect geographical knowledge of the last century, meet exactly where it was intended they should, and as they are laid down on the most recent and carefully drawn maps of our own time.

The boundary line thus laid down must have been accepted, for it may be seen, in part, clearly indicated on the English map published by Mitchell in 1755. an acknowledged authority. See copy herewith.

The adjustment of the northern boundary line of the Province of Quebec, should, it appears to me, under these circumstances, meet with the full approval of our Legislature. Unfortunately there are obstacles in the way of the execution of such a scheme in its entirety, which involve the adoption of certain modifications suggested by the actual condition of affairs. Thus, all that portion of the Atlantic coast known as *Labrador*, has been ceded by England to the Government of *Newfoundland*, and has for a long time been under the jurisdiction of the latter. To attempt now to reclaim this territory would lead to diplomatic complications which the Federal Government would certainly not bring about. But it appears to me that there is a middle course which might be adopted and which would prove acceptable to all the parties interested.

The pretensions of the old French regime, thus modified, would still comprise a vast region of the highest importance to Quebec, and which in extent and value would be a fair equivalent of the territory claimed by Ontario.

The claim of the Province of Quebec might be defined as follows:—

All the country bounded on the west by a prolongation of the present boundary line between Ontario and Quebec to the south shore of *James' Bay*, and by the shore line of this bay as far as the mouth of *East Main River*; on the north by the right bank of *East Main River* from its mouth to its source, thence by a line drawn to the northernmost waters of the *Grand River Esquimaux*, *Ashuanipi* or *Hamilton*, and by the left bank of this river to its mouth in *Rigolet Bay* (*Hamilton's Inlet*), on the east and north-east by the meridian of the easternmost point of the sources of the *River St. Paul* or *Little Esquimaux*, and on the east by this same river to the fifty-second degree of north latitude, following this parallel to its intersection by the meridian of *Anse au Blanc Sablon*, the present recognized boundary of this province.

This definition comprises a territorial increase of about 116,550 miles in superficies. To pretend to go further, as far as Hudson's Strait, would be in my opinion to include too much. This immense boreal territory, comprising an extent of about 282,800 square miles, would eventually become a source of considerable wealth, but for a long time to come would, if only on account of the administration of justice, involve great expense, while the amount of revenue from it would be very problematical. Further, a careful study of the accounts of the deliberations which were held apart from the Utrecht negotiations, will show that the French settlements never extended very far towards the north on the east coast of Hudson's Bay, and that they never reached the south shore of Hudson's Strait. The arguments of the English Commissioners on this point appear to me very strong.

On the other hand, the proof furnished by the French Commissioners, of prior possession by their Canadian compatriots of the south and south-west shores of this bay is so clear and convincing that it completely justifies the claim of Ontario, at the same time that it establishes the rights of Quebec to the lands in rear of the present boundaries beyond the height of land, which are about comprised within the general description given above. See report of Mr. Douglas Brymner, Archivist, 1883, p.p. 173 to 201.

The boundaries or descriptions to which I have just alluded are shown on the map of the Dominion of Canada marked "A," hereto annexed, and to which I have the honour to direct special attention for the better comprehension of the subject.

(Sgd.) E. E. TACHÉ,
A. C. C. L.

Department of Crown Lands,

Quebec, 26th May, 1886.

Copy received from E. E. Taché, Assistant Commissioner of Crown Lands, Quebec.

See No. 94538, 10-12 January, 1889. { G. F. BAILLAIRGÉ,
Dep. Min. Pub. Wks., Canada.

[The *Gazette*, Montreal, Tuesday, 4th February, 1890.]

"THE NORTHERN FRONTIER OF QUEBEC.

"After recess, Hon. Mr. Mercier moved the following resolution regarding the northern frontiers of the Province;

"Resolved, That in the opinion of this House the northern frontiers of the Province of Quebec are and should be fixed and determined as follows:—From a point on the southern shore of James' Bay intersected by a due north line produced from the head of Lake Temiscamingue, thence northerly and easterly along the shores of the said bay to the mouth of the River East Main, thence ascending and following the centre of the said stream easterly to its source, a distance of about four hundred and eighty miles; thence by a line drawn easterly a distance of one hundred and forty miles, more or less, to strike the nearest points of Ashuanipi or Hamilton River, thence descending and following the centre of the said river until it intersects the boundaries of Newfoundland Territory in Labrador, and, lastly, following the said last named boundaries southerly to Blanc Sablon, on the north shore of the Gulf of St. Lawrence.

That an humble address be presented to His Excellency the Governor General of the Dominion, based on the present resolutions, praying His Excel-

lency to adopt or cause to be adopted the measures necessary to establish and determine in a definite manner the northern frontiers of the Province of Quebec as set forth in the present resolutions.

BOUNDARY BETWEEN CANADA AND NEWFOUNDLAND

ON THE

COAST OF LABRADOR.

From Blanc Sablon, eastward and northward, the east coast of Labrador is under the jurisdiction of Newfoundland, as described in Governor Bannerman's Commission.

See enclosure in No. 4 Despatch from Colonial Office, 10th August, 1863, or page 613 Journal of the Assembly of Newfoundland, 1864.

"Governor, Commander-in-Chief and Vice-Admiral over our said Island of Newfoundland and the islands adjacent, and all the coast of Labrador, from the entrance of Hudson's Straits to a line to be drawn due north and south from Anse Sablon on the said coast, to the 52° of north latitude, and all of the islands adjacent to that part of the said coast of Labrador, as also all forts and garrisons erected and established within the said Island, &c."

The western limit of the Government of Newfoundland is latitude $51^{\circ} 25'$ north, to latitude 52° north, along longitude $57^{\circ} 9'$ west, and includes Blanc Sablon and the Woody Islands. The northern boundary is Cape Chudleigh, in latitude $60^{\circ} 37'$ north, longitude 65° west.—*See Addenda hereinafter.*

The above description will be better understood by the following :—

Their jurisdiction extends westward to the line $57^{\circ} 9'$ of west longitude, running due north from Blanc Sablon on the Strait of Belle-Ile (including Blanc Sablon and the Woody Islands) on the parallel of $51^{\circ} 25'$ of north latitude to the parallel of 52° of north latitude, and thence along the east coast of Labrador up to Cape Chudleigh at $60^{\circ} 37'$ of north latitude, and at 65° of west longitude, at the mouth of Hudson's Strait.

BOUNDARIES OF THE PROVINCE OF ONTARIO.

Chapter 28 of the Public General Acts, passed in the fifty-second and fifty-third years of the reign of Her Majesty Queen Victoria, being the fourth session of the twenty-fourth Parliament of the United Kingdom of Great Britain and Ireland, intituled : "An Act to declare the Boundaries of the Province of Ontario, in the Dominion of Canada." 12th August, 1889.

WHEREAS, the Senate and Commons of Canada in Parliament assembled, have presented to Her Majesty the Queen, the address set forth in the schedule to this Act, respecting the boundaries of the Province of Ontario :

And, whereas, the Government of the Province of Ontario have assented to the boundaries mentioned in that Address :

And, whereas, such boundaries so far as the Province of Ontario adjoins the Province of Quebec are identical with those fixed by the Proclamation of the Governor General issued in November, one thousand seven hundred and ninety-one, which have ever since existed :

And, whereas, such boundaries, so far as the Province of Ontario adjoins the Province of Manitoba are identical with those found to be the correct boundaries by a report of the Judicial Committee of the Privy Council, which Her Majesty the Queen in Council, on the eleventh day of August, one thousand eight hundred and eighty-four, ordered to be carried into execution :

And, whereas, it is expedient that the boundaries of the Province of Ontario should be declared by authority of Parliament in accordance with the said address :

Be it therefore enacted by the Queen's Most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal and Commons, in this Parliament assembled, and by the authority of the same, as follows :

1. This Act may be cited as the Canada (Ontario Boundary) Act, 1889.
2. It is hereby declared that the westerly, northerly and easterly boundaries of the Province of Ontario are those described in the address set forth in the Schedule to this Act.

SCHEDULE.

Address to the Queen from the Senate and House of Commons of Canada.

We, your Majesty's most dutiful and loyal subjects, the Senate and Commons of Canada, in Parliament Assembled, humbly approach Your Majesty with the request that Your Majesty may be graciously pleased to cause a measure to be submitted to the Parliament of the United Kingdom, declaring and providing the following to be the westerly, northerly and easterly boundaries of the Province of Ontario, that is to say :—

Commencing at the point where the international boundary between the United States of America and Canada strikes the western shores of Lake Superior, thence westerly along the said boundary to the north-west angle of the Lake of the Woods ; thence along a line drawn due north until it strikes the middle line of the course of the river discharging the waters of the lake called Lac Seul, or the Lonely Lake, whether above or below its confluence with the stream flowing from the Lake of the Woods towards Lake Winnipeg ; and thence proceeding eastward from the point at which the before mentioned line strikes the middle line of the course of the river last aforesaid, along the middle line of the course of the same river (whether called by the name of the English River, or, as to the part below the confluence, by the name of the River Winnipeg) up to Lac Seul, or the Lonely Lake and thence along the middle line of Lac Seul or the Lonely Lake, to the head of that lake ; and thence by a straight line to the nearest point of the middle line of the waters of Lake St. Joseph ; and thence along that middle line until it reaches the foot or outlet of that lake, and thence along the middle line of the river by which the waters of Lake St. Joseph discharge themselves to the shore of the part of Hudson's Bay, commonly known as James' Bay ; and thence south-easterly following upon the said shore to a point where a line drawn due north from the head of Lake Temiscamingue would strike it ; and thence due south along the said line to the head of the said lake ; and thence through the middle channel of the said lake into the Ottawa River ; and thence descending along the middle of

the channel of the said river to the intersection by the prolongation of the western limits of the Seigneurie of Rigaud, such mid-channel being as indicated on a map of the Ottawa Ship Canal Survey, made by Walter Shanly, C. E., and approved by Order of the Governor General in Council, dated the twenty-first July, one thousand eight hundred and eighty-six; and thence southerly following the said westerly boundary of the Seigneurie of Rigaud to the south-west angle of the said Seigneurie; and thence southerly along the western boundary of the augmentation of the Township of Newton to the north-west angle of the Seigniorie of Longueuil, and thence south-easterly along the south-western boundary of said Seigniorie of New Longueuil to a stone boundary on the north bank of the Lake of St. Francis, at the cove west of Point au Baudet; such line from the Ottawa River to Lake St. Francis being as indicated on a plan of the line of boundary between Upper and Lower Canada, made in accordance with the Act 23 Victoria, Chapter 21, and approved by Order of the Governor General in Council, dated the 16th of March, 1861.

PROVINCE OF MANITOBA.

By the Act 44 Vic., chap. 14, assented to 21st March, 1881, the boundaries of the Province of Manitoba were extended easterly to the eastern limit of the District of Keewatin; westerly to a line drawn between the twenty-ninth and thirtieth ranges of townships lying west of the first principal meridian in the system of Dominion land surveys, and northerly to the twelfth base line in said system of Dominion land surveys.

BRITISH COLUMBIA.

By the convention signed at Paris in February, 1825, it was agreed that the line of demarcation between British Columbia and the Russian possessions should be drawn in the following manner:—

Commencing from the southernmost point of Prince of Wales Island, thence north along Portland Channel until the line strikes the 56th degree of north latitude; thence along the summit of the mountains situated parallel to the coast as far as the point of intersection of the 141st degree of west longitude (of the same meridian); and from the said point of intersection along the line of the 141st degree in its prolongation as far as the Frozen Ocean.

By 29 and 30 Vic., cap. 67, sec. 7, it was directed that British Columbia should comprise all such territories within the dominions of Her Majesty, as are bounded to the south by the territories of the United States, to the west by the Pacific Ocean and the frontier of the Russian territories in North America, to the north by the 60th parallel of north latitude, and to the east from the boundary of the United States northwards, by the Rocky Mountains and the 120th meridian of west longitude.

By 47th Vic., cap. 14, Statutes B. C. (1884), there was granted to the Dominion Government 3,500,000 acres of land in that portion of the Peace River district lying east of the Rocky Mountains, and adjoining the North-West Territory of Canada, to be located by the Dominion in one rectangular block.

KEEWATIN.

By chap. 53, Revised Statutes of Canada, the boundaries of Keewatin are thus described :—

Beginning at the point of intersection of the northern boundary of Manitoba and the western shore of Lake Winnipeg ; thence northerly, following the western shore of Lake Winnipeg and of the Nelson River to the point where the latter is intersected by the eighteenth correction line in the system of Dominion Lands surveys ; thence west along the said correction line to a point where the same would be intersected by a line drawn due north from the north end of the portage leading from the head of Lake Winnipegosis into Cedar Lake, known as the “Cedar” or “Mossy” portage ; thence due north to the northerly limits of Canada ; thence easterly, following upon the said northerly limits of Canada to the northerly extremity of Hudson’s Bay ; thence southerly, following upon the westerly shore of the said Hudson’s Bay to the point where it would be intersected by a line drawn due north from a point where the westerly boundary of the Province of Ontario intersects the international boundary line dividing Canada from the United States ; thence due south to the said northerly boundary of the said Province of Manitoba ; thence westerly, along the said northerly boundary, to the place of beginning.

This description was made before the western boundary of Ontario was fixed by the Imperial Act of 1889.

PROVISIONAL DISTRICTS—NORTH-WEST TERRITORIES.

In view of the rapid development of the North-West Territories, beyond the boundaries of Manitoba, consequent upon the near completion of the Canadian Pacific Railway, it was deemed desirable that a portion of these vast territories should be divided into Provisional Districts for the convenience of settlers and for postal purposes. As the country is being rapidly settled, the necessity for public works is being felt, and several have been executed, or are in course of construction ; a copy of the Order in Council creating these Provisional Districts is, therefore, appended in order that the locations of new works may be more readily determined.

G. F. B.

CERTIFIED Copy of a Report of a Committee of the Honourable the Privy Council, approved by His Excellency the Governor General in Council, 8th May, 1882.

On a Memorandum from the Minister of the Interior, hereunto annexed, submitting that for the convenience of settlers and for postal purposes, a portion of the North-West Territories should be divided into provisional districts and their boundaries defined :

The Committee concur in the recommendations contained in the said Memorandum, and submit the same for Your Excellency’s approval.

JOHN J. McGEE.

DEPARTMENT OF THE INTERIOR,
OTTAWA, 8th May, 1882.

The undersigned has the honour to report :—

That in his opinion, it is expedient for the convenience of settlers in the North-West Territories, and for postal purposes, that a portion of such Territories should be divided into Provisional Districts, and he recommends that four such districts be at once described and their boundaries settled.

He recommends that the four such districts be named *Assiniboia*, *Saskatchewan*, *Alberta*, and *Athabasca*.

He further recommends that the boundaries of such districts be as follows :

1st. Assiniboia.

The District of Assiniboia, about 95,000 square miles in extent, to be bounded on the south by the International boundary line, the 49th parallel; on the east by the western boundary of Manitoba; on the north by the 9th correction line of the Dominion Lands system of survey into townships, which is near to the 52nd parallel of latitude; on the west by the line dividing the 10th and 11th ranges of townships, numbered from the fourth initial meridian of the Dominion Lands system aforesaid.

2nd. Saskatchewan.

The District of Saskatchewan, about 114,000 square miles in extent, to be bounded on the south by the District of Assiniboia and by Manitoba; on the east by Lake Winnipeg and the Nelson River, flowing therefrom into Hudson's Bay; on the north by the 18th correction line of the Dominion Lands Survey system; and on the west by the line of that system dividing the 10th and 11th ranges of townships numbered from the fourth initial meridian.

3rd. Alberta.

The District of Alberta, about 100,000 square miles in extent, to be bounded on the south by the International boundary; on the east by the District of Assiniboia; on the west by the Province of British Columbia; and on the north by the 18th correction line before mentioned, which is near the 55th parallel of latitude.

4th. Athabasca.

The District of Athabasca, about 122,000 square miles in extent, to be bounded on the south by the District of Alberta; on the east by the line between the 10th and 11th ranges of the Dominion Lands townships, before mentioned, until, in proceeding northward, that line intersects the Athabasca River; then by that river and the Athabasca Lake and Slave River to the intersection of the last with the northern boundary of the district, which is to be the 32nd correction line of the Dominion Lands township system, and is very nearly on the 60th parallel of north latitude; westward by the Province of British Columbia.

A map of the proposed districts is hereunto annexed.

All of which is recommended.

(Signed) JOHN A. MACDONALD,
Minister of the Interior.

CESSION OF ALASKA, ETC., BY RUSSIA TO UNITED STATES.

CONVENTION FOR THE CESSION OF THE RUSSIAN POSSESSIONS IN NORTH AMERICA TO THE UNITED STATES. (CONCLUDED 30TH MARCH, 1867. PROCLAIMED 20TH JUNE, 1867.)

His Majesty the Emperor of all the Russians agrees to cede to the United States all the territory and dominion now possessed by His Majesty on the Continent of America and in the adjacent islands, the same being contained within the geographical limits herein set forth, to wit:

The eastern limit is the line of demarcation between the Russian and the British possessions in North America, as established by the convention between Russia and Great Britain, of February 28-16, 1825, and described in Articles III. and IV. of said convention in the following terms: "Commencing from the southernmost point of the island called Prince of Wales Island, which point lies in the parallel of $54^{\circ} 40'$ north latitude, and between the 131st and 133rd degree of west longitude, the said line shall ascend to the north, along the channel called Portland Channel, as far as the point of the continent where it strikes the 56th degree of north latitude; from this last-mentioned point, the line of demarcation shall follow the summit of the mountains situated parallel to the coast, as far as the point of intersection of the 141st degree of west longitude, and, finally, from the said point of intersection, the said meridian line of the 141st degree, in its prolongation as far as the Frozen Ocean.

IV. With reference to the line of demarcation laid down in the preceding article, it is understood:

"1st. That the island called Prince of Wales Island shall belong wholly to Russia (now by this cession to the United States).

"2nd. That whenever the summit of the mountains, which extend in a direction parallel to the coast from the 56th degree of north latitude to the point of intersection of the 141st degree of west longitude, shall prove to be at the distance of more than ten marine leagues from the ocean, the limit between the British possessions and the line of coast, which is to belong to Russia, as above mentioned (that is to say, the limit to the possessions ceded by this convention), shall be formed by a line parallel to the winding of the coast, and which shall never exceed the distance of ten marine leagues therefrom.

"The western limit, within which the territories and dominion conveyed are contained, passes through a point in Behring's Straits, on the parallel of $65^{\circ} 30'$ north latitude, at its intersection by the meridian which passes midway between the islands of Krusenstern or Ignalook and the island of Ratmanoff or Noonarbook, and proceeds due north without limitation into the same Frozen Ocean. The same western limit, beginning at the same initial point, proceeds thence in a course nearly south-west through Behring's Straits and Behring's Sea, so as to pass midway between the north-west point of the island of St. Lawrence and the south-east point of Cape Choukotski to the meridian of 172° west longitude: thence, from the intersection of that meridian, in a south-westerly direction, so as to pass midway between the island of Attou and the Copper Island of the Kormandorski couplet or group in the North Pacific Ocean, to the meridian of 193° west longitude, so as to include in the territory conveyed the whole of the Aleutian Islands east of that meridian."

PART IX.

CHRONOLOGICAL ENUMERATION

OF

VOYAGES OF DISCOVERY IN THE NORTH, IN SEARCH OF A NORTHERN COMMUNICATION BETWEEN THE ATLANTIC AND PACIFIC OCEANS, INCLUDING SUCH OTHER VOYAGES AS HAVE BEEN CON- DUCIVE TO THE ADVANCEMENT OF DISCOVERY IN THE NORTH.

CHRONOLOGICAL enumeration of Voyages undertaken by the different Nations of the World in search of a Northern communication between the Atlantic and Pacific Oceans; including such other voyages as have been conducive to the advancement of Discovery in the North.

ABBREVIATIONS.

Da. Danish.	F. French.	P. Portuguese.	Sw. Swedish.
Du. Dutch.	Ice. Icelandic.	R. Russian.	U.S. United States.
E. English.	N. Norwegian.	Sp. Spanish.	V. Venetian.
			W. Welch.

BEFORE CHRIST. 340. A. D. 861.	F.	Iceland stated to have been discovered by Pytheas, the French navigator of Marseilles.
864.	N.	Iceland accidentally discovered by one Naddodd, a Scandinavian pirate, and called by him Schneeland or Snowland.
865 to 870. 874.	Sw. Sw.	Iceland visited by a Swede of the name of Gardar Snaffarson, who wintered there. This island was visited again by one Flocke, who named it Iceland.
About 890.	N.	Iceland visited by Ingolf and Lief (Hjorleifr), who formed a settlement there about four years afterwards.
About 970. 982.	N. N.	Ohthere coasted along the west shore of Norway towards the north and east, and discovered the entrance of the White Sea. Greenland discovered by one Gunbjorn.
About 986.	Ice.	This country was visited by Eric Rauda, who wintered there, and spent part of three years in exploring it. He named it Greenland.
1001.	Ice.	A colonizing voyage undertaken by Eric Rauda to Greenland, with a fleet of 25 vessels, not above one-half of which reached their destination.
About 1003.	Ice.	Biorn, while on a voyage to Greenland, in search of his father, was driven out of his course by a storm, and accidentally discovered Winland.
1006 or 1008.	Ice.	Lief, the son of one Eric Rauda, with Biorn as pilot, re-visited Winland, and wintered in the country in about the latitude of 50° N.
About 1010.	Ice.	Thorwald, the brother of Lief, pursued discoveries in Winland, and in the adjacent country, during three years, and then was killed by a party of the natives.
1170.	W.	A voyage to Winland was undertaken by one Thorstein, but being driven upon the coast of Greenland, himself and many of his retinue died.
About 1284. 1284 to 1294. 1463 or 1464.	V. V. P.	Some part of America or the West Indies, said to be discovered by Madoc, son of Owen Guyneth, Prince of North Wales. Nicholas Zeno, in a voyage from Shetland or Ferow, visited the coast of Greenland. Antonio Zeno visited Iceland and Greenland, and, as some suppose, Winland also.
1492.	Sp.	John Vaz Costa Cortereal, on a voyage towards the N.-W., is said to have discovered the Terra de Bacalhao, afterwards named Newfoundland.
1494 ?	E.	Columbus, in a voyage undertaken for the discovery of a western passage to India, discovered the West Indies.
1497.	E.	John Cabot, and Sebastian his son, are said to have discovered Newfoundland, and called it Prima Vista.
1500.	P.	America discovered by Sebastian Cabot, when on a voyage in search of a North-West passage to India, and the coast examined from latitude 67½ to 38°.
1501.	P.	Gaspar Cortereal, with two ships, fitted out for re-search towards the North-West visited Greenland and Labrador, and discovered the River St. Lawrence, together with some islands contiguous to the American coast.
1502.	P.	Gaspar Cortereal undertook a second voyage in search of a N. W. passage with two ships; he made the coast of Greenland, but being separated from his consort in a storm, was never heard of afterwards. His consort returned home safe.
1504.	F.	Michael Cortereal, with three ships, proceeded in search of his brother Gaspar Cortereal, when himself and ship's company likewise perished. The two other ships under his direction, however, got safe home.
1506.	F.	Newfoundland and Cape Breton visited by the Biscayners and Bretons, for the purpose of fishing.
1508.	F.	Jean Denis, with Camart, a native of Rouen, as pilot, sailed from Honfleur to Newfoundland, and is said to have been the first who laid down a chart of this country.
1524.	F.	The coast of Newfoundland examined by one Aubert, in a ship called the "Pensee."
..... 1527.	Sp. E.	Juan Verrazani sailed to America, and proceeded along the coast about 700 leagues. This part, included between the parallels of perhaps 30° North and 56° North was named New France. Estevan Gomer, towards the N.-W. No discovery appears to have been made.
1534.	F.	Two ships, one of which was called the "Dominus Vobiscum," were sent out for discoveries towards the North Pole. One of the ships was lost, and little or nothing accomplished.
	F.	Jacques Cartier proceeded in search of a W. or N.-W. passage; sailed up the Gulf of St. Lawrence.

CHRONOLOGICAL List of Voyages—*Continued.*

A.D.		
1535.	F.	Jacques Cartier, with three ships, performed a second voyage up the River St. Lawrence, which he examined as high as Montreal. He wintered in the St. Lawrence, where 25 of his crew died of scurvy.
1536.	E.	A voyage towards the N.-W. of the ships "Trinité" and "Minion," in which Cape Breton and Newfoundland were visited. The crews suffered much from famine.
About 1537.	Sp.	Francisco Ulloa, under the orders of Cortez, the conqueror of Mexico, appears to have made a voyage, with three ships, for discoveries towards the N. or W. or respecting the Strait of Anian.
1540.	F.	Jacques Cartier made a third voyage with five ships, towards the N.-W. This, however, was entirely a colonizing expedition. For after remaining two years in North America, he was joined, by appointment, by Roberval, Lieutenant-General and Viceroy of Canada, Newfoundland, Labrador, &c., who established a colony near Quebec.
1542.	Sp.	A journey from Mexico towards the north, undertaken by one Coronado, in search of the Strait of Anian; unsuccessful.
.....	Sp.	Alarcon sent from Mexico in search of the Strait of Anian by sea; unsuccessful.
1542 or 1544.	Sp.	Juan Rodriguez de Cabrillo, with an object similar to the two last, proceeded along the N.-W. coast of America as high as latitude 44° N.
1553.	E.	Sir Hugh Willoughby and Richard Chancellor, with three ships, went out for the discovery of foreign countries. Sir H. discovered Nova Zembla, and, on attempting to winter in Lapland, perished, together with the crews of two of the ships. Chancellor, in the other ship discovered the White Sea to near about the Dwina, and travelled overland from thence to Moscow.
1555.	E.	Richard Chancellor embarked on a trading voyage to the same quarter; he was drowned on his return in 1556.
.....	P.	Martin Chaque; a pretended voyage through North America.
1556.	E.	Stephen Burrough proceeded in a small vessel for discovery, &c., towards the N.-E. He visited Nova Zembla, and discovered the Island of Weigats.
.....	Sp.	Andrea Urdanietta; a pretended voyage.
1564.	Da.	Dithmar Bieffkens sailed from Iceland towards the N.-E. A feeble attempt.
1576.	E.	Martin Frobisher, with three small vessels, proceeded in search of a N.-W. passage; discovered Frobisher's Strait or Lumley's Inlet, also the land Meta Incognita, and is said to have found gold ore.
1577.	E.	A second voyage was undertaken by Frobisher, in search of a N.-W. passage, and gold ore. Nothing discovered.
.....	E.	Edward Fenton was sent out to attempt the N.-W. passage reversed. The voyage was intercepted by enemies.
1578.	E.	Frobisher, with a fleet of 15 ships, proceeded towards the north-west for forming a settlement, and making discoveries. Hatton's Headland, and some other unimportant places, were discovered or visited; but the main objects of the expedition entirely failed. One ship was lost, and ten persons died on the voyage.
1580.	E.	Arthur Pet and Charles Jackman, with two ships, sailed in search of a N.-E. passage. One of the ships passed the Weigats Strait; the other, after wintering in Norway, was never heard of.
1582.	Sp.	An attempt was made to reverse the N.-W. passage by Francisco Gualle: He sailed from Japan 700 leagues E. N. E. to within 200 leagues of California, and then returned.
1583.	E.	An expedition for colonizing, trading, or making discoveries towards the N.-W., was undertaken by Sir Humphrey Gilbert, with five vessels. One vessel, with about 90 men, was lost.
1585.	E.	John Davis, with two small vessels, sailed in search of a N.-W. passage. He discovered or named the Land of Desolation, Mount Raleigh, Cumberland Island, Cumberland Strait, Dier's Cape, Cape Walsingham, Cape of God's Mercy, Exeter Sound, and Totness Road.
1586.	E.	A second voyage towards the N.-W. for trading and discovery, was undertaken by Davis. He saw more of Greenland and Labrador than any former navigator; but made no discovery of moment. One of his vessels, a pinnace of 10 tons, was lost, and all hands.
1587.	E.	Davis embarked on his third voyage for discovery towards the N.-W. On this occasion he discovered Davis' Strait, London Coast, &c., and named Lumley's Inlet, Warwick's Foreland, Cape Chidley, &c.
1588.	Sp.	A pretended voyage, by Maldonado, through a strait called Anian.
1592.	Sp.	Juan de Fuca performed a voyage to the northward along the W. coast of North America, and imagined he discovered a communication with the Atlantic in an easterly direction.
1594.	Du.	An expedition of four ships, under Cornelis Cornelison, William Barentz, &c., proceeded in search of a N.-E. passage. Some of the ships passed forty leagues beyond Weigat's Strait, and Barentz explored the western coast of Nova Zembla.
1595.	Du.	William Barentz sailed along with another expedition of seven ships, intended for trading and discoveries towards the N.-E., which altogether failed.

CHRONOLOGICAL List of Voyages—*Continued.*

A.D.		
1596.	Du.	Barentz, on a third voyage for discovery towards the N. and E., with two ships, discovered Bear Island, now called Cherie Island, and Spitzbergen. Barentz, with one ship's company, wintered in Nova Zembla; most of his companions got home the next summer in two open boats, but himself and some others died.
.....	Sp.	Sebastiano Vizcaino sailed above 100 leagues to the northward, along the west coast of America. In one place he lost seventeen men.
1598.	F.	The Marquis de la Roche, in a colonizing voyage to the west coast of North America, made some researches.
1602.	Sp.	Vizcaino, in a second voyage to the west coast of America, sailed as high as 42° or 43° north in search of harbours.
.....	E.	George Weymouth, with two vessels, for the discovery of a North-West passage, is said to have sailed 100 leagues to the westward, in a sea nearly corresponding with Hudson's Strait.
1603.	E.	On a voyage towards the north, partly for trading, and partly for discovery, by Stephen Bennet, Bear Island, of Barentz, was visited, and named Cherie Island.
1605.	Da.	James Hall, an Englishman, as pilot, and Gotske Lindenau, a Dane, as Admiral of an expedition of three vessels, intended for the recovery of Lost Greenland and research, gave names to several places in Greenland, but discovered nothing.
1606.	Da.	Hall was employed in a second expedition under Lindenau, of five ships, for research, &c., about the coast of Greenland: nothing of consequence was discovered.
1606.	E.	In a voyage in search of a N.-W. passage, by John Knight, with one small vessel, nothing was discovered: Knight and three of his crew landed on the coast of Labrador, and were never afterwards seen.
1607.	Da.	Hall, in a third voyage, with two ships, in the same direction, only reached Cape Farewell, the crew having mutinied.
.....	E.	Henry Hudson, in a voyage towards the North Pole, with one small vessel only, discovered the E. coast of Greenland, as high as latitude 73°. Young's Cape, Mount of God's Mercy, and Hold with Hope, were positions discovered and named by him: the same voyage he visited Spitzbergen, and sailed to the latitude of about 81°.
1608.	E.	In his second voyage, with one vessel, in search of a N.-E. passage, Hudson landed on Nova Zembla.
1609.	Da.	Hudson, in his third voyage, in the Dutch service, sailed to the eastward of the North Cape, then westerly to Newfoundland, and along the American coast to the southward. The design of this curious navigation is not known.
1610.	E.	Hudson's fourth voyage, in search of a North-West passage, was important. With only one vessel he discovered (?) and passed Hudson's Strait, and discovered Hudson's Bay, where he wintered. The crew of the vessel afterwards mutinied, and forcing Hudson and eight other persons into a boat, left them to perish.
.....	E.	In a voyage for trade and discovery towards the north by Jonas Poole, Horn Sound, Deer Sound, and some other positions in Spitzbergen, were discovered and named. The whole of the country he named Greenland.
1611 or 1614.	Du.	A voyage by a ship belonging to Holland, is said to have been made about this time, in which a distance of 100 leagues to the eastward of Nova Zembla was accomplished (?).
1611.	Du.	The island of Jan Mayen is stated to have been discovered in this year, by the person whose name it bears: it is probable, however, that the discovery was not made until a year or two later.
.....	E.	A voyage towards the north, with two vessels, the principal object of which was to attempt the whale fishery, was undertaken by Jonas Poole; he sailed to latitude 80° N. and also the S.-W., from thence until he was 125 leagues to the westward of Cherie Island. Both ships were lost, but the crews were saved. Great part of the west coast of Spitzbergen was examined, and some bays discovered.
1611 to 1620	E.	Our whale-fishers, in their early voyages, had generally a discovery-vessel along with them. Their researches about the coast were productive of several discoveries, among which, besides bays, harbours and headlands, were Hope, Bear, Abbot's, Edge's, Scott's, Wester, Heling, Sir Thomas Smith's, and various other islands.
1612.	E.	Sir Thomas Button, with two ships, sailed in search of a N.-W. passage by the way of Hudson's Bay. He discovered Nelson's River, Southampton Island, Mancel's Island, &c., and gave names to several remarkable headlands.
.....	E.	James Hall embarked towards the N. W. for the discovery of a passage or treasure, being his fourth voyage, and was killed by an Esquimaux. Cockin Sound discovered.
1614.	E.	Captain Gibbons, in attempting to find a N.-W. passage, got beset, and spent the season in a bay in Labrador; this place is said to have been named in derision "Gibbons his Hole."
.....	E.	Robert Fotherby, having along with him the celebrated Baffin, attempted discoveries in the north and about Spitzbergen, but nothing of consequence was accomplished.
1615.	E.	Robert Bylot, with Baffin as mate, attempted the finding of a N.-W. passage. Discovered Savage Islands, Mill Island, &c., about Hudson's Bay and Strait.

CHRONOLOGICAL List of Voyages—*Continued.*

A.D.		
1616.	E.	William Baffin, appointed as pilot to a small vessel, of which Bylot was master, in searching for a N.-W. passage, discovered and circumnavigated the bay bearing his name. Among other discoveries in this bay that are enumerated, are Women's Islands, Horn Sound, Sir Dudley Digges' Cape, Wostenholm Sound, Whale Sound, Hakluyt's Island, Sir Thomas Smith's Sound, Carey's Islands, Alderman Jones' Sound, Sir James Lancaster's Sound, &c.
1617.	E.	Wiches Land, afterwards named by the Dutch Ryke Yse's Islands, discovered by one of the English whale fishers.
1619.	Da.	Two vessels, under the direction of Jens Munk, were sent out for the discovery of a N.-W. passage. They wintered in Hudson's Bay, where all the people, sixty-four in number, excepting Munk and two others, are stated to have died of the scurvy. These three accomplished their passage home in the smaller vessel.
1620.	E.	In a voyage towards the N.-W., by William Hawkbridge, considerable researches in Hudson's Bay appear to have been made, but nothing was discovered. The year in which this voyage was made, and the ships employed in it, are uncertain.
1631.	E.	A considerable exploration of Hudson's Bay was made by Luke Fox, in which names were given to various islands, promontories and bays. Among the islands he named Sir Thomas Rowe's Welcome, Brooke Cobham, Briggs his Mathematics, &c.; among headlands, Cape Maria, Cape Dorchester, King Charles his Promontorie, &c.
.....	En.	A similar route to that taken by Fox, was pursued by Thomas James, who passed the winter in Hudson's Bay, yet discovered nothing.
1636.	Da.	Greenland was visited, in search for treasure, by a vessel or vessels, fitted out by the Danish Greenland Company.
.....	Ru.	The navigation of the Frozen Sea commenced by the Russians, who formed establishments on the banks of the Lena.
1643.	Du.	A voyage in the ships "Castricum" and "Breskes," under the command of Martin Herizoom Van Vriez and H. C. Schaep, was undertaken from Japan towards the north. Between the Island of Ternate, from whence they sailed, and the latitude of 47°, beyond which they navigated, several islands, including perhaps the Kuriles, were discovered.
1646.	R.	The rivers Jana, Indighirsa, Alasei and Kovina, having been discovered within ten years preceding this date, a voyage for trade and research from the Kovina towards the east, the first in this position, was undertaken by Isai Ignatiev, with a party of Promyschleni, under his direction: They traded with the Tchuktehi.
1647.	R.	A second trading voyage, with four ketches, from the Kovina towards the east, was attempted under the direction of the Kossak, Semoen Deschnew or Deshneff: This altogether failed.
1648.	R.	Seven ketches, from the Kovina, &c., in one of which Semoen Deschnew again sailed, were dispatched towards the east. Six, if not all of these vessels, appear to have been wrecked; but one of them, commanded by Deschnew, previously accomplished the passage, it is supposed, round the great promontory of the Tchuktehi* to the east side of Kamchatka, and was lost near the River Olutura or Aliutori.
1652.	Da.	An expedition of two ships, under Captain Danell, was sent out for discovery of the east side of Greenland. The east coast, at intervals, was seen from latitude 63° 30' to Cape Farewell, but no landing was effected.
1653.	Da.	A second examination by Danell was undertaken. The east coast was again seen, but only at a distance, from Herjolfsness, latitude 64°, to Cape Farewell.
.....	Da.	Three ships, sent out for the discovery of a N.-E. passage, passed the Weigatz, but discovered nothing.
1654.	Du.	Gale Hankens Land, on the east coast of Greenland, intimated by the Dutch charts, as having been discovered by a Greenland trader of the same name.
1655.	Du.	The Land of Edam, east side of Greenland, latitude 78°, marked in the Dutch charts as having been discovered.
1660.	Po.	David Melguer, said to have reversed the N.-E. passage. A pretended voyage.
1668.	E.	A voyage into Hudson's Bay, and for discovery towards the N.-W., was performed by Captain Zachariah Gillam, accompanied by M. de Grosseliez, a Frenchman, by whom the practicability of making an important settlement in this quarter had been suggested. Gillam wintered in Hudson's Bay, and built a small stone fort. The apparent advantages to be derived from settlements, founded on the examinations of this voyage, &c., appear to have led to the formation of the Hudson's Bay Company, which was chartered in the year 1669.
1676.	E.	John Wood and William Flawes, with two ships, proceeded in search of a N.-E. passage. Wood's ship was wrecked on the west coast of Nova Zembla, and no discovery whatever made.
1696.	R.	Kamchatka, discovered by land, by a troop of sixteen Kossaks.
1707.	Du.	A country to the N.-E. of Spitzbergen, named Gilles' Land, intimated by the Dutch charts as having been discovered.

* Captain Burney is of opinion, that this voyage might have been accomplished without doubling the promontory, by taking the vessel in pieces, a practice not uncommon with the Russians, and carrying it over a narrow neck of land between the Kovima and the Anadir.

CHRONOLOGICAL List of Voyages—Continued.

A.D.		
1712.	R.	Mercuri Wagin, a Cossak, with a party of eleven men, proceeded from the river Jana across a surface of ice, in sledges drawn by dogs, towards the north, and is said to have discovered and landed on a large island. Having suffered great hardships on their return, Wagin, his son, and another Cossak, to whom their difficulties were attributed, were murdered by the rest of the party.
1715.	R.	A remarkable journey from the Jana towards the north, was accomplished by Alexei Markoff. He travelled by means of sledges drawn by dogs, across a frozen sea, as far north, it is supposed, as the 78th degree of latitude, without finding land, and accomplished a journey of about 800 miles in twenty-four days.
1716.	R.	The first voyage from Ochotzk to Kamitchatka was performed by Henry Busch, a native of Hoorn, in North Holland.
1719.	J.	Two vessels, under the direction of James Knight, and commanded by George Barlow and David Vaughan, were sent out by the Hudson's Bay Company, to search for "the Strait of Anian, in order to discover gold, &c., to the northward." Neither of these ships ever returned: Knight and his companions are supposed to have perished at Marble Island in Hudson's Bay.
1721	Da.	The Greenland Company of Bergen established a colony on the west coast of Greenland, of which Hans Egede, the enterprising and zealous missionary, was a member.
1722	E.	A voyage from Churchill River, Hudson's Bay, was undertaken by John Scroggs, in search of Knight. He examined several parts of the bay without success. He does not appear, indeed, to have paid much attention to the original object of the voyage.
1723	Da.	A ship sent out by the Bergen Greenland Company, for reconnoitring Davis' Strait, was lost, and all hands, it is supposed perished.
1724	Da.	Two ships fitted out by the Bergen Company for discovery, one for exploring the west side of Davis' Strait, in the 67th parallel, and the other for examining the east coast of Greenland, effected nothing.
.....	R.	About this time several voyages and journeys were made by the Russians, on and about the Frozen Sea, in search of northern lands, in which several islands were discovered.
1728	R.	Captain Vitus Behring was employed in a voyage from Kamitchatka, for discoveries towards the north, and for ascertaining whether Asia and America were continuous. He sailed as high as 67° 18' N. latitude, having passed the place now called Behring's Strait.
1729	R.	Behring sailed on his second voyage from Kamitchatka, in search of land towards the east. He did not, however, leave the land above 200 versts, and discovered nothing.
.....	Da.	Lieutenant Richard made an unsuccessful attempt to reach the east coast of Greenland, in the parallel of Iceland.
1730 or 1731	R.	A vessel was dispatched under the orders of the Surveyor Gwosdew and Tryphon Krupischew, a Cossak officer, for the purpose of inviting the Tchukchei to pay tribute; in this voyage the West Coast of America, in the 66th parallel, was discovered.
1734 and 1735	R.	The navigation from Archangel to the West Coast of the peninsula separating the Gulfs of Kama and Obi, was accomplished by Lieutenant Morovieff.
1735	R.	Lieutenant Lasseus sailed from the Lena towards the east, and wintered in the River Charaulack, where 46 out of 52 persons, composing his crew, died of the scurvy.
1735 36	R.	Lieutenant Protitschiff sailed from the Lena westward, and after wintering in the Olenc, proceeded to the height of 77° 25', and westward to the Bay of Taimourska.
.....	R.	A voyage from the Lena somewhat to the eastward of the Charaulack, was performed by Dmitri Laptiew.
1737	E.	Two ships equipped by the Hudson's Bay Company, for discoveries in Hudson's Bay and towards the N.-W., appear to have accomplished little or nothing.
1738	R.	The navigation from Archangel towards the east, by the Russians, commenced in 1734, was continued by Lieutenants Miyagin and Skuratow, and accomplished as far as the Obi.
.....	R.	The voyage from the Obi to the Eniesi was accomplished by Lieutenants Owzen and Kuschlew.
1739 and 1740	R.	Lieutenant Laptieff, on his second voyage in the Frozen Sea, sailed from the Lena, wintered in the Indighira, and proceeded the next spring to the Kovina, from whence, according to some authors, he crossed the isthmus of the Tchukchei to the river Anadir, communicating with the sea of Kamitchatka.*
1741	R.	An expedition of two vessels, under Commodore Behring and Captain Tschirikow, was dispatched from Ochotzk in 1740, which, after wintering in Kamitchatka, proceeded towards America, for the purpose of making discoveries about its shores. The ships being separated on the passage, Behring discovered the Continent in latitude 58° 28' and Tschirikow in 55° 36'. The former, after discovering several islands, lost his ship on one of the Aleutians, called Behring's Island, where he died. The latter returned, having lost two boats and their crews on the American coast.

* The combined result of these Russian navigations in the Frozen Sea, is briefly traced in Chap. 1 and 2 of Vol. I. of Scoresby's "Arctic Regions," 1820.

CHRONOLOGICAL List of Voyages—*Continued.*

A.D.		
1741 and 1742	E.	Some part of the Welcome, in Hudson's Bay, examined by Christopher Middleton and William Moor, with two vessels, after having wintered in Churchill River. The object of the voyage was the discovery of a N.-W. passage.
1743	—	A reward of £20,000 offered by Parliament, for the discovery of a N.-W. passage, by the way of Hudson's Bay. (18th Geo. II., c. 17.)
1746	E.	Two ships, under the command of William Moor and Francis Smith, sent out in search of a N.-W. passage, by the way of Hudson's Bay. The first summer they examined some part of the Welcome, and after wintering in Haye's River, made a good exploration of Wager River, previously supposed to be a strait.
1753	Am.	Captain Charles Swaine, in the schooner "Argo," sailed from Philadelphia for the discovery of a N.-W. passage; but being unable to penetrate through Hudson's Strait, he examined a large extent of the Labrador Coast, from 56° it is said, to latitude 65°.
1760 to 1763	R.	A most persevering but unsuccessful attempt was made by a Russian merchant of the name of Shalauoff to sail from the Lena round the great Tchutkchi promontory. He first wintered in the Jana, and then twice in the Kovima. He discovered some islands and a bay, being the farthest spot he reached, which has been named Tschacon Bay.
1761.	E.	A sloop, under the command of Captain Christopher, was sent by the Hudson's Bay Company to explore Chesterfield Inlet in Hudson's Bay, with the expectation that it might be the opening of a N.-W. passage. Christopher is said to have penetrated above 150 miles, and then returned.
1762.	E.	Christopher was again sent out to complete the examination of Chesterfield Inlet, when he traced it by a river into a lake, 24 miles long, and 6 or 7 broad; and across this to the westward into another river, until his further progress, even in boats, was interrupted by falls.
1764.	R.	The indefatigable Shalauoff made a final attempt to pass from the Lena round the Tchutkchi promontory, in which he is supposed to have perished, as neither himself nor any of his companions ever returned.
1769.	Da.	Baron Von Uhlfeldt through Hudson's Bay into the Pacific. A pretended voyage.
1669 to 1772.	E.	A journey by Samuel Hearne, after two unsuccessful attempts, accomplished from Prince of Wales Fort, Hudson's Bay, to the Copper-Mine River, supposed to fall into the Northern Ocean.
1772.	A.	A second voyage for the discovery of a N.-W. passage, seems to have been attempted by the Americans; Captain Wilder, in the brig "Diligence," having sailed to latitude 69° 11' with such a design. This vessel was fitted out by means of the subscriptions of some gentlemen of Virginia.
1773.	E.	In a voyage towards the North Pole, with two vessels under the charge of Constantine John Phipps and Skeffington Lutwidge, the latitude of 80° 48' was reached, and some interesting surveys and observations made, but no discoveries.
1775.	Sp.	A voyage for discovery along the west side of North America, made, by order of the Viceroy of Mexico, by Bruno Heceta and others; they reached the latitude of 57° 18' N.
1776.		The reward of £20,000 for the discovery of a N.-W. passage extended, not by the way of Hudson's Bay and in merchant ships only, but to any ships, even those of His Majesty, which, by a former Act, were excluded, and in any northern direction between the Atlantic and Pacific Oceans: Also, an award of £5,000 to any ship that should approach within one degree of the North Pole. (16th Geo. III, cap. 6.)
1776.	E.	Richard Pickersgill, in the brig "Lion," was sent to Baffin's Bay for the protection of the whale-fishers, and for the examination of the coasts. He only reached the latitude of 68° 10', and then returned without having accomplished almost anything.
1777	E.	The same vessel was again equipped, under the command of Lieutenant Walter Young, who was ordered to examine Baffin's Bay, and attempt to find a N.-W. passage, with a view, it seems, of meeting Captain Cook, who was expected about the same time to be trying to reverse the same track. But Young, having reached to the height of 72° 42', though so early as the month of June, tacked, and soon after returned home.
1776	E.	The adventurous navigator, James Cook, with two ships under his direction, being appointed to make discoveries towards the reversing of a N.-W. passage, passed Behring's Strait on his third voyage, in the summer of 1778, and discovered or named Cape Prince of Wales, Point Mulgrave, Icy Cape, Cape Lisburne, Cape North, &c., and advanced to the northward as high as latitude 70° 44' N., which limit being unable to pass, he returned to the southward to spend the winter. In one of the Sandwich Islands, Owhyhee, this celebrated character lost his life.
1779	E.	After the death of Captain Cook, a second examination of the icy sea, to the northward of Behring's Strait, was undertaken by Charles Clerke, in which the same two ships reached the latitude of 70° 33', beyond which they were unable to advance on account of ice.
1786 & 1787	Da.	An expedition under Captain Lowenorn and Lieutenant Egede, was sent out from Copenhagen for the recovery of lost Greenland. Several attempts were made to reach the coast about the parallel of 65°, without being able to approach nearer than about 50 miles on account of ice; Lowenorn returned to Denmark in July, and Egede to

CHRONOLOGICAL List of Voyages—Continued.

A. D.		
		Iceland to refit. The latter made another attempt in the month of August, when he reached within 10 miles of the land, and then proceeded to Iceland, where he wintered. The next year, Egede, with two small vessels, one commanded by Lieut. Rothé, made other trials to approach the Greenland coast, but with less success than before, never being able to reach the land within 30 miles.
1787 to 1791	R.	Joseph Billings, an Englishman, was employed in the service of Russia for researches about Behring's Strait and the Tchutkchi Promontory. In 1787, he made a short voyage from the Kovina into the Icy Sea; in 1790, he sailed from Kamtschatka to the Aleutian Islands; and from thence, the same year, he sailed to the Bay of St. Lawrence, on the south side of Cape East, Behring's Strait, where he landed, and traced the coasts to the northward as far as Klutshenie Bay, the eastern side of which is formed by Cape North. From this place he crossed the country towards the west, and arrived at the Kovina in 1791.
1789.	E.	Alexander Mackenzie accomplished a river navigation from Fort Chipewyan, on the south side of the Lake of the Hills, as far as latitude 69° 14', where he was evidently on the borders of the Hyperborean Sea, or near the mouth of a river communicating with it. The river he descended is now named Mackenzie's River.
1789.	Sp.	Two corvettes, under the orders of Malaspina, were sent to the N.-W. of America, to search for a navigable communication from the Pacific to the Atlantic, between the parallels of 53° and 60° N.
1790 to 1792.	E.	Charles Duncan sailed in one of the Hudson's Bay ships, with the view of being furnished with a small vessel on his arrival out, for making investigations towards a N.-W. passage; but, being disappointed both in the vessel and crew provided for him, he returned to England without attempting anything. The following year he proceeded on the adventure towards the N.-W. in a small vessel fitted out of London; wintered in Hudson's Bay, then made some slight examination of Chesterfield's Inlet, and again returned to a port in the Bay to winter. After these failures or disappointments, nothing else by him was attempted.
1791 to 1795.	E.	Two vessels, under the command of George Vancouver, were sent out to the west coast of North America, partly for receiving back some territories which had been seized by the Spaniards, and partly for discovery in regard of a navigable communication from the Pacific to the Atlantic, between the parallels of 30° and 60° N. The whole of the west coast was accordingly traced from latitude 30° to the head of Cook's Inlet, in about 61° 18'. In this laborious investigation, Vancouver sailed almost 1,000 miles in channels, in some places very contracted, between ranges of islands and the main. The non-existence of a passage through the continent, within the limits prescribed, was well established.
1805 to 1809.	R.	Several islands to the northward of that part of Russia, included between the Jana and the Kovina, were discovered in different brief northern expeditions, among which was an extensive tract of country, now called New Siberia.
1815 to 1818.	R.	Lieutenant Kotzebue, in a small vessel called the "Rurick," was employed for making discoveries to the northward of Behring's Strait on the side of America. He passed Behring's Strait in 1816, and after some little time spent in research, returned to the southward to winter. The next summer, Kotzebue proceeded again towards the north; but having met with a personal accident, was obliged to bear up homeward, after reaching the mouth of Behring's Strait.
1818.	E.	John Ross and William Edward Parry, proceeded with two well equipped ships, for the discovery of a N.-W. passage. They circumnavigated Baffin's Bay, proved the non-existence of Cumberland Island, discovered some part of the west coast that was not seen by Baffin, and gave names to numerous positions in the course of their navigation.
1818.	E.	David Buchan and John Franklin, with two ships, undertook a voyage for discovery towards the North Pole. One of the vessels received damage in the best part of the season, and occasioned, it is said, the return of the expedition before that research had been made which was intended.
1818 & 1819.	E.	Rewards to navigators, for advancing to latitude 83° N. and to longitude 110° W., within the Arctic circle, with a progressive increase of premiums for sailing still nearer to the North Pole, and making further advances in the discovery of a N.-W. passage, permitted by Act of Parliament, and fixed by an Order in Council. Act 58th Geo. III., c. 20, and <i>London Gazette</i> , 23rd March, 1819.
1819.	E.	William Edward Parry was again dispatched for discoveries towards the N. W. with two vessels under his direction. The issue not yet known.
1819-20-21-22	E.	Sir John Franklin's first expedition with Dr. Richardson, from Gravesend, England, 23rd May, 1819, to York Factory, Hudson's Bay, which he left 30th August, 1819; thence overland by chain of rivers and lakes, to Athabasca Lake, Great Slave Lake, Yellow Knife and Copper-Mine Rivers, and thence Eastward on the Polar Sea to Cape Turnagain, latitude 68° 18' 50" N., longitude 108° 25' W., which was reached 18th August, 1821. During the return journey, 22nd August to 2nd November, 1821, from Polar Sea to Fort Enterprise, latitude 64° N., longitude 112° 30' W., the party suffered greatly from cold and starvation; 1 man was lost, 4 died, and 5 were murdered on the way, by one of the guides.

CHRONOLOGICAL List of Voyages—Continued.

A.D.		
1825-26-27.	E.	Franklin, who was accompanied by Dr. Richardson and Hepburn, returned to York Factory 14th June, 1822, and thence to England. Franklin's second expedition with Dr. Richardson, from New York to Fort William; thence <i>via</i> Lake Winnipeg, Cumberland House and chain of lakes to the River Mackenzie; thence down this river to the Polar Sea and along its east and west coasts. They reached Garry Island, at mouth of the Mackenzie towards latitude 69°, longitude 136°, — in August, 1825, returned to Fort Franklin, Great Bear Lake and spent the winter there; during the following year, they again descended, 24th June to 7th July, to the mouth of the Mackenzie. Here they separated; Franklin proceeded, on the Polar Sea, with 2 boats and 8 men each, to Ice Reef, latitude 70° 26' and longitude 148° 52', Westward, where he arrived 17th August. Dr Richardson with 2 boats and 6 men each, proceeded eastward to the mouth of the Copper-Mine River, in latitude 67° 47' 50" and longitude 115° 49' 33"; he thence ascended this river a distance of about 60 miles and went overland to Fort Confidence at N.E. or upper end of Great Bear Lake; he continued thence by canoe and by boat down to Fort Franklin at the lower or east end of the lake, where he arrived on the 1st September, having coasted 318 miles along the shore, the distance in a direct line being about 175 statute miles. Franklin returned by the Mackenzie and reached the same Fort on the 21st of the same month. They returned to England in 1827.
1845-46-47.	E.	Franklin's third, last and fatal expedition, <i>via</i> Davis Strait, Baffin Sea, Lancaster Sound, Beechey Island, Wellington Channel up to head of Grinnell Land, latitude 77° N., and about 97° of longitude W.; thence down channel along east side of Bathurst Island and west side of Cornwallis Island; thence down Peel Sound to Boothia Felix and King William's Island, in search of a passage to Behring Sea and the Pacific Ocean, with two ships the "Erebus" and "Terror." From a record found in a cairn near the head of King William's Island, in May, 1859, by Lieut. W. R. Hobson, under McClintock, it appears that the latter died 11th June, 1847, at which time the total loss by deaths had been 9 officers and 15 men, out of a party of 105 who had landed there 22nd April, 1847, their vessels having been beset by ice since 12th September, 1846. This document was dated 25th April, 1848, and signed by Captain F. R. M. Crozier of the "Terror," and Captain James Fitzjames of the "Erebus." They added a note stating that they would start next day for Back's Fish River. For details see Captain McClintock's narrative respecting Franklin's discoveries and his own, published in London, 1859. For further details respecting Franklin's three expeditions, see Part IV.
31st Aug., 1875.	E.	Capt. George Nares with the "Alert" and "Discovery" reached latitude 82° 25' N., longitude 61° 30' W. The "Alert" was moored near Cape Sheridan, Floeberg Beach, the highest latitude ever attained by any vessel.
27th Sept., 1875.	E.	Lieut. Aldrich of Nares' expedition, made a sledge journey on the Polar Sea to latitude 83° 7', longitude 63° 5'; he saw Cape Columbia, longitude 87° 30' W.
12th May, 1876.	E.	Commander Markham and Lieut. Parr of Nares' expedition, planted the British Flag on the Polar Sea, latitude 83° 20' 26" N., longitude 63° 5' W.
18th May, 1876.	E.	Lieut. Aldrich, sledge journey to Cape Alert near Cape Alfred Ernest, Grinnell Land, westward along the Polar Sea, latitude 82° 16', longitude 85° 33'.
21st May, 1876.	E.	Lieut. L. A. Beaumont, Nares' expedition, sledge journey to Sherard Osborn Fiord, latitude 82° 20' N., longitude 54° 34' W.
8th June, 1881.	U.S.	Lieut. Com. George W. De Long's expedition of 33 persons reached latitude 77° 15' N., longitude 155° E., on the Polar Sea, westward of Bennett Island and northward of Siberia. His vessel the "Jeannette" was crushed by ice. De Long and his party travelled across the floating and creviced ice with sledges and boats to the mouth of the River Lena, Siberia, which 23 of the party reached 12th and 17th Sept., 1881, the others having been lost at sea; 21 of the party died from exhaustion and starvation. Only 12 survived; the remains of the deceased were sent to the United States.
13th May, 1882.		Lieut. Adolphus W. Greely's expedition. His second Lieut. J. B. Lockwood and Sergeant D. L. Braunard reached the furthest point ever reached by man, at Lockwood Island, latitude 82° 24' N., longitude 40° 46' W., by traversing the ice of the Polar Sea with a sledge. Greely sailed from St. John, Newfoundland, 7th July, 1881, with 22 persons; he engaged 2 Eskimos on the way, which made a party of 24 in all. He reached Discovery Harbour in Franklin's Bay, 11th August, and there established Fort Conger, as his headquarters. Greely wintered there in 1881-82; on 9th August, 1883, he abandoned Fort Conger where he left all his books and proceeded southward to Baird Inlet which he reached 29th September, after being adrift for thirty days in the midst of the ice floes of Smith's Sound. His permanent camp was established at Cape Sabine 21st October, 1883.

CHRONOLOGICAL List of Voyages—*Concluded.*

A.D.	U.S.	
		He was rescued there, 22nd June, 1884, by the "Thetis" and "Bear."
		Out of the entire party of 25, there remained 7 alive; 16 had died of starvation, 1 was drowned whilst sealing to procure food for his companions and 1 had been shot by Greely's orders for robbing the provisions on which the others relied for their sustenance. Out of the 18 deceased, 6 had been partly eaten, 5 had been swept away from their graves into the Sea, and 1 was drowned. Twelve bodies of the dead were recovered and brought on board of the two vessels. One Eskimo was buried at Disco.

NOTE—The above record of "Voyages of Discovery in the North" from 861 A.D. to 1819 A.D. has been taken from pages 54 to 71 inclusive, of the Appendix to the 1st Volume of the Arctic Regions by W. Scoresby, Jun., F. R. S. E., printed in Edinburgh, 1820.

The remainder subsequent to 1819 has been extracted from the narratives of the respective voyages.

EXPEDITIONS for the Relief of Sir John Franklin.

1. FROM THE WEST THROUGH BEHRING STRAIT.

Year.	Vessels.	Commanders.
1848-52.....	Plover.....	Commander Moore and Captain Maguire.
1848-49.....	Herald.....	Captain Kellett.
1850-55.....	Enterprise.....	do Collinson.
	Investigator.....	Commander McClure.

2. FROM THE EAST THROUGH BAFFIN SEA.

1848-49.....	Enterprise.....	Sir J. C. Ross.
	Investigator.....	Captain Bird.
1850-51.....	Lady Franklin.....	do Pennv.
	Sophia.....	do Stewart.
	Resolute.....	do Austin.
	Assistance.....	do Ommaney.
	Pioneer.....	Lieutenant Osborn.
	Intrepid.....	do Cator.
	Advance.....	do d'Haven, U.S.N.
	Rescue.....	Master Griffin, U.S.N.
1852-54.....	Assistance.....	Sir E. Belcher.
	Resolute.....	Capt. Kellett.
	Pioneer.....	Lieutenant Osborn.
	Intrepid.....	do McClintock.
	North Star.....	Captain Bullen.
1853.....	Phoenix.....	Commander Inglefield.
	Breadalbane.....	Lieutenant Fawcner.
1853-58.....	Advance.....	Dr. Kane, U.S.N.
1854.....	Phoenix.....	Commander Inglefield.
	Talbot.....	do Jenkins.
1855.....	Release.....	Lieutenant Hartesteen, U.S.N.
	Arctic.....	do Simmes, U.S.N.
1857-59.....	Fox.....	Captain McClintock.

LIEUTENANT COMMANDER DeLONG'S EXPEDITION.

The United States steamer "Jeannette," Lieut. Com. George W. DeLong, sailed from San Francisco 8th June, 1879; afterwards from St. Michael's, Alaska, by the Strait of Behring and reached Lat. 77° 15' north by Long. 155 east, where she was crushed in by ice, 13th June, 1881. DeLong and his party succeeded to land at the mouth of the Delta of the Lena, 12th and 17th September, 1881. G. W. Melville and 11 others were the only survivors out of an entire party of 33, of whom 10 perished at sea before reaching the Lena. The remains of De Long and 10 of his companions were found 23rd March, 1882, and interred in the United States, 22d February, 1884.

GREELY'S EXPEDITION.

July 7, 1881.—Left St. John's, Nfld., with a party of 23 men; afterwards shipped two Eskimo's at Upernivik.

July 16, 1881.—He reached Godhavn.

July 23, 1881.—He reached Upernivik.

August 12, 1881.—He reached Discovery Bay.

The steamer "Proteus" after having landed Greely and his party at Discovery Bay, left, 25th August, to return to St. John's, Nfld.

Greely wintered in 1881-82 at Fort Conger.

August 9, 1883.—Greely abandoned Discovery Bay and arrived at Cape Sabine, 6th October, 1883.

He wintered in 1883 at Cape Sabine.

The extreme point reached by Lieut. A. W. Greely's sledge expedition was $83^{\circ} 24'$ north, which is the highest latitude attained by man, and was named "Lockwood Island," in honor of Lieut. J. B. Lockwood, the officer in charge of the party who reached there on 13th May, 1882, at $40^{\circ} 46'$ west longitude, with Sergt. Brainard and the Eskimo, Christiansen.

EXPEDITION FOR THE RESCUE OF GREELY, 1882-84.

1. 1882.—Steamer "Neptune" left St. John 8th July, 1882, and reached Cape Hawks, 10th August, but was obliged to return to St. John's, Nfld.

2. 1883.—Steamer "Proteus," which had been chartered for Greely's scientific expedition in 1881, was chosen by the Relief Party of 1883. She sank near Cape Albert, 23rd July, the Relief Party succeeding to land at Cape Sabine which was abandoned to retreat on Upernivik, where they found the steamship "Yantic" stationed. The "Yantic" left immediately with the Relief Party and reached St. John's, 13th September, 1883.

3. 1884.—Steamers "Thetis" and "Bear" sailed from St. John's, 12th May, for Cape Sabine. They left Cape Sabine, 23rd June, 1884, with Greely and six other survivors and the remains of twelve of the explorers, and arrived at St. John's, 16th July, 1884. One Eskimo was buried on the way at Disco.

TEMPERATURE FAHRENHEIT

OBSERVED 1882, DURING GREELY'S EXPEDITION.

April 27, 1882.—At Cape Bryant, Lincoln Sea.....	—	14.0
May 5, 1882.—At Cape Britannia ".....	+	2.0
May 13, 1882.—At Lockwood Island ".....	+	14.0
June 29, 1882.—Highest in the shade, near Fort Conger +		74
June, July, August, 1882.—Mean at do ...	+	26.3
July, 1882.—Mean at do ...	+	30.0
Feb. 3, 1882.—Lowest at do ...	—	62.2
Feb. 3, 1882.—Mean at do ...	—	52.9
Feb. 3, 1882.—Highest at do ...	—	44.1

Game found by Greely, August 12, 1881, to July 1883, north of latitude 81° N. :—

Ice-bears, wolves, foxes, musk-oxen, ermines, hares, walrus, seals, salmon, lemmings, ducks, geese, gulls, ravens, owls, ptarmigans, skuars, sand-pipers, sanderlings, etc.

NOTE.—Greely states that alcohol thermometers cannot always be relied upon for temperatures below 60° Fahrenheit.

ADDENDA

TO

CANADA FROM THE ATLANTIC TO THE PACIFIC AND ARCTIC OCEANS,

ARCTIC EXPEDITIONS

AND

VOYAGES OF DISCOVERY.

NAUTICAL AND STATUTE MILES

CORRESPONDING TO

A DEGREE OF $\frac{1}{4}$ LONGITUDE AT THE VARIOUS LATITUDES

AND THE

DEFINITION THEREOF.

The following table shows how many Nautical Miles answer to a degree of Longitude at every Degree of Latitude.

Latitude.	Knots.	Latitude.	Knots.	Latitude.	Knots.	Latitude.	Knots.	Latitude.	Knots.	Latitude.	Knots.	Latitude.	Knots.	Latitude.	Knots.
1	59.99	11	58.90	21	56.01	31	51.43	41	45.28	51	37.76	61	29.69	71	19.53
2	59.96	12	58.69	22	55.63	32	50.88	42	45.59	52	36.94	62	28.17	72	18.54
3	59.92	13	58.46	23	55.23	33	50.32	43	43.88	53	36.11	63	27.24	73	17.54
4	59.85	14	58.22	24	54.81	34	49.74	44	43.16	54	35.27	64	26.30	74	16.54
5	59.77	15	57.96	25	54.38	35	49.15	45	42.43	55	34.41	65	25.36	75	15.53
6	59.67	16	57.68	26	53.93	36	48.54	46	41.68	56	33.55	66	24.40	76	14.52
7	59.55	17	57.38	27	53.46	37	47.92	47	40.92	57	32.68	67	23.44	77	13.50
8	59.42	18	57.06	28	52.98	38	47.28	48	40.15	58	31.80	68	22.48	78	12.47
9	59.26	19	56.73	29	52.48	39	46.63	49	39.36	59	30.90	69	21.50	79	11.45
10	59.09	20	56.38	30	51.96	40	45.96	50	38.57	60	30.09	70	20.52	80	10.42

Lengths of a degree of longitude in different latitudes, and at the level of the sea.

These lengths are in common land or statute miles of 5,280 feet. Since the figure of the earth has never been *precisely* ascertained, these are but close approximations.

Degree of Latitude.	Miles.	Degree of Latitude.	Miles.	Degree of Latitude.	Miles.	Degree of Latitude.	Miles.	Degree of Latitude.	Miles.	Degree of Latitude.	Miles.
0	69.16	14	67.12	28	61.11	42	51.47	56	38.76	70	23.72
2	69.12	16	66.50	30	59.94	44	49.83	58	36.74	72	21.43
4	68.99	18	65.80	32	58.70	46	48.12	60	34.67	74	19.12
6	68.78	20	65.02	34	57.39	48	46.36	62	32.55	76	16.78
8	68.49	22	64.15	36	56.01	50	44.54	64	30.40	78	14.42
10	68.12	24	63.21	38	54.56	52	42.67	66	28.21	80	12.05
12	67.66	26	62.20	40	53.05	54	40.74	68	25.98	82	9.66

DEFINITION OF GEOGRAPHICAL OR NAUTICAL AND STATUTE MILES.

A nautical mile, or a sea mile, is the length of one minute of longitude on the earth at the equator, at the level of the sea, or the $\frac{1}{60}$ part of the earth's equatorial circumference. By the United States standard, and as used by the Coast Survey, its length is 1.152664 common statute or land miles; 1855.11 metres; 2028.69 yards; or 6086.07 feet; consequently, one degree of longitude at the equator=69.160 land miles; and a land mile=0.86755 of a nautical mile. By British standard the sea mile is about 4 inches longer than by United States. Sometimes one minute of a mean *latitude* is taken as a nautical mile. A minute of latitude at the equator is about 6,046 feet; and at the Poles about 6,107; the mean of which is 6,076½ feet.

TIME OF HIGH WATER AT FULL AND CHANGE

AND

RISE OF NEAP AND SPRING TIDES

AT VARIOUS PLACES IN

CANADA.

PROVINCE OF NOVA SCOTIA.
ATLANTIC OCEAN AND GULF OF ST. LAWRENCE.

Port or Harbour.	County.	High Water, Full and Change.	Rise or Tides.		Range of Tides.	Authority.
			Ft. In.	Ft. In.		
Adelaide Bay	Cumberland	11 55	33 0	39 0	Highest spring tide, 46 ft. above ordinary low water springs.	Pub. Works Dept., G. F. Baillairgé, 1871.
Amherst.	do	11 45	38 0	45 3	do	do
Antigonish Harbour.	Antigonish	9 0	2 0	4 0	do	Capt. Shortland, 1829.
Arichat Harbour, C.B.	Richmond	8 10	4 0	5 0	do	Capt. Bayfield, 1849.
Arisaig.	Antigonish	10 6	3 3	5 3	do	do
Aspic Bay.	Victoria	7 30	4 0	6 0	do	do
Avon River (mouth of).	Hants	12 30	40 0	48 0	do	Capt. Shortland, 1829.
Beam of Mines (Need Bay).	do	12 41	43 6	50 6	do	do
Blind Bay.	Halifax.	7 46	6 0	7 6	do	do
Cape North.	Victoria.	8 0	3 0	4 0	do	Capt. Bayfield, 1857.
Cape St. John.	Inverness.	8 15	2 0	3 6	do	do
Chatham, C.B.	Antigonish	11 0	23 0	27 6	do	Capt. Shortland, 1829.
Digby tide.	Guysborough	8 20	4 6	6 6	do	do
Guysborough Harbour.	Halifax.	7 49	5 0	6 0	do	do
Halifax.	Hants.	12 30	40 0	48 0	do	Capt. Bayfield, 1853.
Hantsport.	Victoria, C.B.	8 11	2 9	3 11	do	do
Ingonish (south).	Guysborough	8 0	4 6	6 6	do	do
Isle of St. John, N.S.	Queen's	7 50	5 3	7 4	do	Capt. Orlebar, 1857-58.
Liverpool.	Cape Breton	8 0	4 0	5 0	do	Capt. Shortland, 1861-62.
Louisbourg Harbour, C.B.	do	7 54	6 0	7 3	do	Capt. Bayfield, 1847.
Louisbourg.	Inverness	9 0	2 0	4 0	do	do
Malou Harbour.	do	8 40	2 0	3 6	do	Capt. Bayfield, 1842.
Margaree River (mouth of).	Antigonish	10 6	3 3	5 3	do	do
Morignish Harbour.	Cumberland	11 50	18 0	22 0	do	Capt. Shortland, 1862.
Parrishorough.	Digby	10 41	4 0	6 0	do	Capt. Bayfield, 1843.
Petit Passage.	Pictou	10 0	4 0	6 0	do	do
Pictou Harbour.	do	9 0	2 0	4 6	do	do
Port Hood.	Inverness.	7 00	5 0	8 0	do	do
Port Medway.	Queen's.	7 54	5 9	7 9	do	Capt. Shortland, 1861-62.
Port Montserrat.	do	9 0	2 0	4 6	do	do

Place.	9 25.	10 0.	12 0.	Neap range, 8 ft.	do	Capt.	do	1850-53.
Yarmouth	10 30	4 0	7 0	do	do	Hayfield,	1840.	
Untherland	8 34	4 0	0 0	do	do	do	1852-57.	
Victoria	7 30	4 0	0 0	do	do	do	1848.	
Rechnon	7 30	0 0	4 0	do	do	do	1851.	
do	6 30	0 0	4 0	do	do	do	1851.	
Halifax	7 54	4 6	6 6	Neap range, 2½ ft.	do	Capt. Shortland,	1854.	
Shellburne	8 4	5 6	7 0	do	do	do	1846.	
Shelburne	9 40	10 3	12 3	do	do	do	1852.	
Antigonish	9 15	2 0	4 0	do	do	do	1850.	
Cape Breton	8 15	4 0	5 0	do	do	Hayfield,	1840.	
Culbaster	10 0	5 0	8 0	do	do	do	1841.	
Cydnarough	8 0	4 0	6 0	do	do	do	1847.	
Antigonish	9 15	2 6	4 0	do	do	do	1847.	
Yarmouth	10 9	13 0	16 0	Neap range, 10 ft.	do	Capt. Shortland,	1852.	
Untherland	10 30	5 0	8 0	do	do	Capt. Hayfield,	1840.	
Dugby	10 45	17 0	20 9	do	do	do	1840.	
Cydnarough	8 0	4 0	6 6	Neap range, 4½ ft.	do	do	1855.	
Whitehaven, Marshall's Cove.								

PROVINCE OF NEW BRUNSWICK.
ATLANTIC OCEAN, GULF OF ST. LAWRENCE, AND BAIE DES CHALEURS.

Port or Harbour.	County.	High Water, Full and Change.	Rise of Tides.		Range of Tides.	Authority.
			Neaps.	Spring.		
		H. M.	Ft. In.	Ft. In.		
Baie Verte.....	Westmoreland.....	10 30	5 0	9 0	Highest spring tide, 10½ ft.	Public Works Dept., G. F. Baillairgé, 1871.
do.....	do.....	9 0	2 0	4 0	.....	.....
Bathurst.....	Gloucester.....	3 15	4 0	7 0	.....	Admiralty Charts, Capt. Bayfield, 1839.
Beaubien, Miramichi River.....	Northumberland.....	6 30	4 0	6 0	.....	do do do 1837.
Beaver Harbour.....	Charlotte.....	11 9	20 0	23 6	.....	do do do 1839.
Buctouche River.....	Kent.....	7 0	2 0	4 0	.....	do do do 1839.
Campbellton.....	Bertignache.....	4 0	7 0	10 0	.....	do do do 1839.
Campo Bello Island.....	Charlotte.....	11 21	20 0	23 6	Neaps range, 16½ ft.	do do do 1847.
Casagette Harbour.....	Gloucester.....	2 45	3 0	6 0	.....	do do do 1839.
Casagette do.....	Kent.....	7 30	2 0	4 0	.....	do do do 1843.
Folly Point, Cumberland Basin.....	Westmoreland.....	11 49	38 0	45 0	.....	do do do 1861.
Fort Cumberland*.....	do.....	11 55	38 0	45 3	Highest spring tide, 46 ft. above ordinary low water springs.	Public Works Dept., G. F. Baillairgé, 1871.
Grand Harbour, Grand Manan.....	Charlotte.....	11 7	17 6	21 0	Neap range, 14 ft.	Admiralty Charts, Com. Shortland, 1855.
Grindstone, Cumberland Basin.....	Westmoreland.....	11 47	34 6	41 0	.....	do do do 1861.
Lepprean.....	Charlotte.....	11 18	21 0	24 6	.....	do do do 1848.
Miscou Harbour.....	Gloucester.....	3 30	3 0	5 0	.....	do do do 1839.
Quaco.....	St. John.....	11 35	25 0	30 0	.....	do do do 1839.
Richibucto.....	Northumberland.....	Once in 24 hours, 3.30 a.m.	2 6	4 0	.....	do do do 1839.
Richibucto River.....	do.....	Once in 24 hours, 3.30 a.m.	2 6	4 0	.....	do do do 1839.
Sackville, Bay of Fundy.....	Westmoreland.....	11 55	38 0	45 3	.....	Com. Shortland, 1861.
St. John Harbour.....	St. John.....	11 21	23 0	27 0	Neap range, 19 ft.	Lieut. Harting, 1844.
Seal Cove, Grand Manan.....	Charlotte.....	10 54	15 0	20 0	do 10 ft.	Com. Shortland, 1855.
Shediac Harbour.....	Westmoreland.....	8 0	2 0	4 0	.....	do do do 1839.
Sheldrake River, Miramichi Bay.....	Northumberland.....	6 0	3 0	5 0	.....	do do do 1837.
Shippegan Harbour.....	Gloucester.....	3 40	3 0	5 6	.....	do do do 1839.

* Fort Cumberland—Observed by Saxby, 5th October, 1863.—Observed by G. F. Baillairgé, 25th October, 1875.
50.00 feet. 46.00 feet above extraordinary low water springs.
25.80 do 48.00 do extreme do do

PROVINCE OF PRINCE EDWARD ISLAND.
GULF OF ST. LAWRENCE.

Port or Harbour.	County.	High Water, Full and Change.		Rise or Times.		Range of Tides.	Authority.
		H. M.	Ft. In.	Ft. In.	Ft. In.		
Bedford Harbour	Prince	10 15	5 0	7 0		Admiralty charts, Capt. Bayfield, 1841.	
Cartigan Bay.	King's	8 40	3 3	3 0		do do 1844.	
Chacumiquet.	Prince	5 40	3 0	3 0		do do 1841.	
Charlottetown	Queen's	10 45	7 0	9 6		do do 1843 & 44.	
Crabapple	do	10 0	6 0	8 0		do do 1842.	
East Point.	King's	8 30	2 0	3 6		do do 1847.	
Grand (Beaumont) River.	do	8 40	2 9	4 9		do do 1843.	
Hillsborough Bay	Queen's	10 45	7 1	9 5		do do 1842.	
Murray Harbour.	King's	9 6	3 3	6 3		do do 1843.	
Richmond Bay.	Prince	6 0	2 0	3 0		do do 1841.	
St. Peter's Harbour	King's	8 0	2 6	4 0		do do 1847.	
Treacoe Harbour	Queen's	7 0	2 0	4 0		do do 1847.	

PROVINCE OF QUEBEC.
RIVER ST. LAWRENCE, NORTH AND SOUTH SHORES.

Port or Harbour.	County.	High Water, Full and Change.	Rise of Tides.		Range of Tides.	Authority.
			Neaps.	Springs.		
		H. M.	Ft. In.	Ft. In.		
Magdalen Islands.....	Gaspé.....	8 30	2 0	3 0	.....	Admiralty Charts, Lieut. Collins, 1833.
Bay of Seven Islands.....	Saguenay.....	1 40	5 0	9 0	.....	Admiralty Charts, Capt. Bayfield, 1831.
Bear Bay, Anticosti Island.....	do.....	1 10	3 0	5 3	.....	do do 1830.
Boine-Espérance Harbour.....	do.....	9 15	2 6	5 0	.....	do do 1834.
Bradore Bay.....	do.....	8 45	2 0	4 0	The stream of flood drives into this Bay, and the ebb out, but it is much influenced by the winds.	do do 1834.
Bernardin River.....	Saguenay.....	2 0	7 0	12 0	.....	do do 1831.
Bie Island.....	Rimouski.....	2 15	8 6	14 0	.....	do do 1827 34.
Brandy Pot.....	Trinacourata.....	3 6	10 0	17 0	Ebb 6h. 30m.; flows 5h. 50m. Ebb 6h. 34m.; flows 5h. 56m. by the shore. Ebb continues to run 1h. after low water; flood continues to run 3h. after high water.	do do 1834.
Cape Chatte.....	Gaspé.....	2 4	6 0	12 0	.....	do do 1827 34.
Carleton Point.....	Bonaventure.....	3 0	4 0	6 0	.....	do do 1834.
Cawee Islands.....	Saguenay.....	1 50	5 0	9 0	.....	do do 1839.
Champlain.....	Champlain.....	9 45	2 0	3 0	The tide flows by the shore, but the current is always down.	do do 1834.
Chicoutimi.....	Chicoutimi.....	5 11	8 0	12 0	.....	do do 1831 37.
Cheverwater Point.....	Champlain.....	11 30	3 0	5 0	.....	do do 1827 34.
Couacou Bay.....	do.....	10 30	8 0	5 0	.....	do do 1834.
East Cape, Anticosti Island.....	Chicoutimi.....	1 0	3 0	5 0	.....	do do 1830.
Egg Island, W. Point, North Island.....	do.....	2 40	6 0	11 0	.....	do do 1834.
Gaspé.....	Gaspé.....	2 40	3 0	5 0	Extraordinary Tides, 7 feet Ebb 6h. 24m.; flows by the shore, 6h.	do do 1832.
Green Island.....	Trinacourata.....	2 45	9 6	16 0	.....	do do 1834.
Kamouraska.....	Kamouraska.....	4 0	10 0	17 0	.....	do do 1827 34.
Kegashka Bay.....	Saguenay.....	10 45	3 0	5 0	.....	do do 1827 34.
Little Nacabiquan.....	Kamouraska.....	11 0	8 0	5 0	.....	do do 1834.
Little Metus, at Boulton.....	Rimouski.....	3 0	14 4	Pub. Works Dept., C. Taché, 1822.
Macquereau Point.....	Bonaventure.....	2 0	3 0	5 0	Pub. Works Dept., C. F. Roy, 1880.

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PROVINCE OF BRITISH COLUMBIA.
PACIFIC OCEAN.

Port or Harbour.	Electoral District.	High Water, Full and Change.		Rise of Tides.		Range of Tide ^a .	Authority.
		Ft. In.	Ft. In.	Neap ^b .	Springs.		
Beaver Harbour. Lat. 50 42' 36" N. Long. 127 25' 7" W. Clayoquot Sound.	Vancouver Island do	0 30	11 6	15 9	12 0	Queen Charlotte's Sound, N.E. side of Vancouver Island.	Admiralty Charts, Capt. G. H. Richards, R.N., 1890.
Esquimalt (Duntze Head). Lat. 48 25' 49" N. Long. 125° 36' 45" W. Fraser River.	Victoria New Westminster. Vancouver Island	12 0	3 0	5 to 8	7 to 10	S.W. side of Vancouver Island, on the Pacific Ocean, Strait of Fuca.	do 1891.
Kyuquot Sound. Lat. 49 59' 55" N. Long. 127 9' 30" W. Nanaimo Lat. 49 46' 15" N. Long. 125 56' 36" W.	Vancouver Vancouver Island	6 30	12 0	10 0	12 0	On mainland, Strait of Georgia.	do 1892.
Nootka Sound (Friendly Cove). Lat. 49 35' 31" N. Long. 126 37' 32" W. Port Moody	Vancouver Island New Westminster.	5 0	12 0	Mean spring ranges, 14 0	Mean spring ranges, 12 0	S.W. side of Vancouver Island, Pacific Ocean.	do 1893.
Port Simpson (Village North Pt.). Lat. 54 33' 51" N. Long. 130 26' 36" W. Quatsino Lat. 50 29' 25" N. Long. 128 3' 20" W. Sitka or New Arkhangelsk (Arsenal). Lat. 57 2' 54" N. Long. 135 17' 12" W.	Caribou Vancouver Island On Territory ceded by Russia in 1867 to the United States Government.	6 0	3 0	5 to 8	7 to 10	On mainland, Burrard Inlet, Strait of Georgia.	do 1892.
Victoria (Laurel Point) Lat. 48° 26' 22" N. Long. 128° 23' 27" W.	Victoria	12 0	0 30	12 0	12 0	On S.W. side of Vancouver Island, towards upper end of Queen Charlotte's Islands.	do 1892.
						On S.W. side of Vancouver Island, towards upper end, on Pacific Ocean.	do 1893.
						On W. side of Baranoff Island, north of Queen Charlotte's Islands, on the Pacific Ocean.	do 1890.
						Commander Pearce states that the rise of tide never exceeds 17 feet.	do 1890.
						Strait of Fuca, Vancouver Island, S.E. end.	Admiralty Charts, Capt. G. H. Richards, R.N., 1890.

OPENING AND CLOSING
OF
NAVIGATION
AT VARIOUS CANADIAN PORTS
FROM THE
ATLANTIC OCEAN TO WINNIPEG,
1823 to 1829.

OPENING and Closing of Navigation at

Name of Port.	Location.	Closed in 1883.	Opened in 1884.	Closed in 1884.	Opened in 1885.
Charlottetown, P.E.I.	Gulf St. Lawrence	Dec. 23.	April 24.	Dec. 20.	April 22.
Georgetown do	do	Jan. 12, '84.	do 24.	Jan. 26, '85.	do 24.
Pictou, N.S.	do	Dec. 23.	do 17.	Dec. 24.	do 21.
Sydney, C.B.	Atlantic Ocean	Jan. 3, '84.	do 26.	Jan. 19, '85.	May 4.
Shediac, N.B.	Gulf St. Lawrence	Dec. 1.	May 12.		
Campbellton, N.B.	Baie des Chaleurs	do 4.	April 27.	Dec. 12.	May 6.
Bathurst, N.B.	do	Nov. 29.	do 28.		
Percé, P.Q.	Gulf St. Lawrence	do 23.	do 25.	Dec. 1.	May 1.
Gaspé Basin, P.Q.	do	Dec. 11.	May 5.	do 8.	do 15.
Tadoussac, P.Q.	River St. Lawrence			Nov. 18.	do 16.
Quebec, P.Q.	do	Nov. 24.	April 30.	Dec. 12.	April 29.
Sorel, P.Q.	River Richelieu	do 28.	do 9.	do 11.	do 24.
St. John's, P.Q.	do	do 30.	do 16.	Nov. 29.	do 20.
Montreal, P.Q.	River St. Lawrence	Dec. 16.	do 22.	Dec. 18.	May 5.
Three Rivers, P.Q.	do				
Kingston, Ont.	Lake Ontario	Dec. 31.	April 19.	Dec. 31.	April 28.
Belleville, Ont.	do	do 14.	do 19.	do 12.	do 19.
Port Hope, Ont.	do	do 13.	do 1.	do 12.	do 15.
Toronto, Ont.	do	do 21.	March 30.	do 19.	do 25.
Port Stanley, Ont.	Lake Erie	do 28.	April 1.	do 19.	do 21.
Port Dover, Ont.	do	Nov. 30.	do 17.	do 11.	do 28.
Windsor, Ont.	Detroit River	Dec. 17.	March 15.	do 17.	Jan. 14.
Sarnia, Ont.	Lake Huron	Jan. 3, '84.	do 31.	do 25.	April 14.
Goderich, Ont.	do	Dec. 3.	April 20.	do 15.	May 6.
Kincardine, Ont.	do	do 28.	May 6.	Nov. 24.	do 6.
Owen Sound, Ont.	Georgian Bay	do 17.	April 26.	Dec. 1.	do 3.
Collingwood, Ont.	do	do 10.	do 23.	do 31.	do 7.
Wiarton, Ont.	do				
Saut-Ste-Marie, Ont.	Lake Superior	Dec. 9.	April 25.	Dec. 10.	May 6.
Port Arthur, Ont.	do	do 22.	May 6.	do 14.	do 13.
Winnipeg, Man.	Red River	Nov. 10.	April 24.	Nov. 1.	April 25.

various Ports in Canada, 1883 to 1889.

Closed in 1885.	Opened in 1886.	Closed in 1886.	Opened in 1887.	Closed in 1887.	Opened in 1888.	Closed in 1888.	Opened in 1889.
Jan. 9, '86	April 20	Dec. 29	April 26	Dec. 27	April 21	Jan. 12, '89	March 30
Feb. 23, '86	March 30	Feb. 8, '87	do 6	Jan. 23, '88	do 30	Feb. 25, '89	do 6
Dec. 31	April 3	Dec. 30	do 11	Dec. 25	do 15	Jan. 14, '89	do 14
Jan. 14, '86	do 19	Jan. 7, '87	do 26	Jan. 10, '88	do 25	Feb. 8, '89	April 4
Dec. 7	do 27	Dec. 10	May 7	Dec. 23	May 8	Dec. 12	do 18
do 10	May 26	do 4	do 6	do 1	do 8	Nov. 18	do 25
do 1	do 27			Nov. 25	do 8	Dec. 5	do 25
Nov. 18	April 12	Dec. 5	April 20	do 23	April 22	Nov. 23	do 30
Dec. 26	do 30	do 11	May 9	Dec. 25	May 15	Dec. 27	May 1
Nov. 18	do 30	Nov. 22	April 23	Nov. 24	April 10	do 5	March 15
do 21	do 29	do 24	do 30	do 23	do 29	Nov. 24	April 23
Dec. 4	do 21	Dec. 3	May 2	do 30	May 1	Dec. 13	April 16
Nov. 30	do 15	Nov. 27	April 27	do 29	April 19	Nov. 24	do 18
Dec. 7	do 24	Dec. 4	May 1	Dec. 23	do 29	Dec. 14	do 27
						Nov. 28	do 30
Jan. 8, '86	April 9	Dec. 30	April 19	Dec. 30	do 12	Jan. 19, '89	do 2
Dec. 5	do 19	Nov. 30	do 25	Nov. 30	do 23	Nov. 25	do 13
do 18	do 2	Dec. 7	do 7	Dec. 12	do 13	Dec. 10	do 2
Jan. 8, '86	March 20	do 4	do 12	do 9	do 7	do 30	March 15
do 22	do 21	do 6	do 4	do 23	March 31	Feb. 9, '89	do 15
do 1	April 8	do 4	do 8	do 15	April 7	Dec. 12	April 23
do 9	do 28	do 27	Jan. 5	do 16	do 5		
Jan. 8, '86	March 22	do 15	April 4	do 4	do 9	Dec.	April 15
Dec. 14	April 19	Nov. 30	May 2	Nov. 23	do 28	Nov. 24	do 8
Nov. 30	do 3	do 28	April 20	do 15	May 2	Dec. 4	March 26
Dec. 10	do 15	Dec. 11	do 30	Dec. 8	do 4	do 4	April 14
Nov. 24	do 24	do 3	do 20	do 2	April 30	do 1	do 22
		do 24	do 23	Jan. 30, '88	May 1	Nov. 28	do 18
Nov. 20	April 26	do 4	May 1	Dec. 1	do 8	Dec. 4	do 17
Dec. 27	do 29	do 20	do 11	do 22	do 21	do 29	do 13
Nov. 2	do 14	Nov. 4	April 25	Nov. 1	April 28	Nov. 15	do 25

OPENING AND CLOSING
OF
NAVIGATION
AT
QUEBEC, MONTREAL, KINGSTON AND TORONTO,
1814 TO 1889.

OPENING and Closing of Navigation at Quebec, Montreal, Kingston and Toronto,
from 1814 to 1889.

QUEBEC.			MONTREAL.		KINGSTON.		TORONTO.	
Years.	Opened.	Closed.	Opened.	Closed.	Opened.	Closed.	Opened.	Closed.
1814	April 28	Dec. 7						
1815	do 28	do 5						
1816	do 23	Nov. 29						
1817	May 6	Dec. 5						
1818	April 27	do 1						
1819	do 30	do 7						
1820	do 24	do 1						
1821	May 3							
1822	April 29	Dec. 3						
1823	do 25							
1824	do 20	Dec. 11						
1825	do 19							
1826	do 22	Dec. 21						
1827	do 12							
1828	do 18							
1829	do 17	Dec. 4						
1831	do 21	Nov. 30						
1832	do 29	do 30			April 27	do 4		
1833	do 19	do 25			do 7	Jan. 1, '34		
1834	do 18	Dec. 9			Mar. 19	Dec. 22		
1835	May 4	do 1			April 6	do 31		
1836	do 10	do 1			do 23	do 26		
1837	do 2	do 12			do 11	Jan. 16, '38		
1838	do 1	Nov. 26			do 6	Dec. 18		
1839	April 23	Dec. 19			do 8	do 26		
1840	do 21	do 2			Mar. 19	do 23		
1841	May 4	do 14			April 23	do 31		
1842	April 26	do 2			Mar. 24	do 31		
1843	May 5	do 1			April 25	Jan. 3, '44		
1844	April 23	Nov. 29			Mar. 9	do 12, '45		
1845	do 23	Dec. 2			April 2	do 9, '46		
1846	do 14	do 9			Mar. 31			
1847	May 11	do 3			April 11	Jan. 6, '48		
1848	April 18	do 5			do 3	Dec. 30		
1849	do 24	do 7			do 3	do 31		
1850	do 26	do 10			do 5	do 26		
1851	do 22	do 5			do 2	do 22		
1852	do 30	do 19			do 19	Jan. 14, '53		
1853	do 26	do 3			do 4	do 5, '54		
1854	May 5	do 5	April 25	Dec. 6	do 10	do 13, '55		
1855	do 8	Nov. 27	do 28	do 12	do 17	do 1, '56	April 2	Dec. 19
1856	April 22	Dec. 2	do 24	do 3	do 8	Dec. 31	do 17	do 22
1857	do 28	do 4	do 18	do 13	do 2	Feb. 2, '58	Feb. 27	do 30
1858	do 16	do 3	do 9	do 12	do 26	Jan. 8, '59	Mar. 4	do 21
1859	do 26	Nov. 29	do 4	do 11	do 15	Dec. 25	Feb. 7	do 30
1860	do 20	Dec. 8	do 10	do 7	do 12	Jan. 10, '61	Jan. 10	do 31
1861	do 26	do 17	do 24	do 22	do 8	do 4, '62	do 2	do 31
1862	do 11	do 5	do 23	do 7	do 14	do 17, '63	do 2	do 30
1863	May 1	do 4	do 25	do 12	do 16	do 1, '64	do 7	do 21
1864	April 19	do 13	do 13	do 11	do 5	do 4, '65	Feb. 3	do 29
1865	do 18	do 9	do 10	do 16	Mar. 28	do 5, '66	Mar. 25	do 30
1866	do 27	do 15	do 19	do 15	April 11	do 5, '67	April 3	do 26
1867	do 17	Nov. 29	do 22	do 6	do 8	Dec. 18	Mar. 28	do 9
1868	do 23	do 28	do 17	do 9	Mar. 31	do 24	April 6	do 12
1869	do 27	do 27	do 25	do 6	April 17	Jan. 8, '70	do 1	do 3
1870	do 16	Dec. 2	do 18	do 18	do 13	Dec. 31	do 3	do 24
1871	do 22	Nov. 25	do 8	do 1	Mar. 16	do 25	Mar. 11	Nov. 30
872	do 30	do 26	May 1	do 8	April 22	do 21	April 12	Dec. 10
873	do 28	do 22	April 25	Nov. 26	do 24	Jan. 14, '74	do 14	Nov. 26
874	do 28	do 25	do 25	Dec. 13	Mar. 28	do 5, '75	Mar. 16	Dec. 29
875	do 29	do 23	May 3	Nov. 29	April 19	Dec. 23	April 16	Nov. 30
876	May 6	do 24	April 27	Dec. 10	do 18	do 20	do 11	Dec. 9
877	April 25	do 26	do 17	Jan. 2, '78	do 9	Jan. 8, '78	Mar. 25	do 19
878	do 20	do 25	Mar. 30	Dec. 23	Mar. 11	do 2, '79	do 9	do 16

OPENING and Closing of Navigation at Quebec, Montreal, Kingston and Toronto
from 1814 to 1889—*Concluded.*

QUEBEC.			MONTREAL.		KINGSTON.		TORONTO.	
Years.	Opened.	Closed.	Opened.	Closed.	Opened.	Closed.	Opened.	Closed.
1879	April 29...	Nov. 28....	April 24....	Dec. 19....	April 21....	Dec. 28....	Mar. 25....	Dec. 24
1880	do 30....	do 27....	do 17....	do 3....	Mar. 23....	do 21....	Feb. 19....	do 8
1881	May 1....	do 24....	do 21....	Jan. 2, '82..	April 12....	Jan. 12, '82	April 16....	do 19
1882	do 5....	do 25....	do 11....	Dec. 9....	Mar. 7....	.....	Feb. 27....	do 9
1883	do 2....	do 24....	do 26....	do 16....	April 19....	Dec. 31....	April 15....	do 21
1884	April 30....	Dec. 12....	do 22....	do 18....	do 19....	do 31....	Mar. 30....	do 19
1885	do 29....	Nov. 21....	May 5....	do 7....	do 28....	Jan. 8, '86	April 25....	Jan 8, '86
1886	do 29....	do 24....	April 24....	do 4....	do 9....	Dec. 30....	Mar. 20....	Dec. 4
1887	do 30....	do 28....	May 1....	do 22....	do 19....	do 30....	April 12....	do 24
1888	do 29....	do 24....	April 29....	do 14....	do 12....	Jan. 19, '89	do 7....	do 20
1889	do 23....	†Dec. 15....	do 14....	do 29....	do 2....	do 22....	Mar. 15....	do 20
1890	.....	.....	.....	.....	Mar. 26....	.....	do 15....	*

* December, 20—Ice broke up and reformed several times.

† The ice formed, the 4th December, in the Tidal Basin and the Wet Dock.

The ice formed, the 14th December, in the River St. Charles.

The ice bridge formed, the 15th December, between the Island of Orleans and the north shore, and, on the 20th following, the ice gave way and had not reformed at the close of the year.

See Appendix No. 47 of General Report of 1867, pages 393 to 400.

For dates of opening and closing of navigation at other ports and on the canals of Canada, together with the draft of water, etc., see General Report Public Works, 1867-1882, pages 906-935, and subsequent annual reports Public Works, also annual reports on Railways and Canals, up to 1890.

PORT OF MONTREAL.

D A T E S

OF

OPENING AND CLOSING OF NAVIGATION,

FROM

1864 to 1889.

PORT OF MONTREAL.

MEMORANDUM TAKEN FROM THE HARBOUR MASTER'S REPORTS, GIVING THE DATES OF THE OPENING AND CLOSING OF NAVIGATION FROM 1864 TO 29TH DECEMBER, 1889.

- 1864—The ice in the harbour began to break and move on the 7th of April; on the 13th, river was clear; close of navigation, 10th December.
- 1865—On the 1st of January, the water gradually rose; on the 14th, the ice shoved; on the 15th, the ice remained stationary.
- 1866—Opening of navigation, 19th April; on the 5th January, 1886, the river was full of ice; on the 6th, the ice became stationary.
- 1867—On the 1st of January, the water was level with the wharves, ice forming fast; on the 9th ice became stationary. The first shove of the ice took place on the 14th April; on the 22nd the harbour was clear of ice.
- 1868—The winter was unusually cold; the river was frozen at an early date, teams crossed on the 16th of December, 1867; on the 19th of March, 1868, ice shoved; on the 4th of April the ice shoved heavily opposite the city; on the 14th and 15th the ice kept moving; on the 17th the harbour was clear.
- 1869—December 28th, the river was frozen over early; on this date, the first team crossed to St. Lambert; in the beginning of 1869, the ice was considered firm for the winter; on the 13th April the ice shoved; on the 18th shoved again; on the 19th it shoved, flooding Griffintown, which continued until the 23rd; at 10 a.m. ice below gave way; on 25th the harbour clear of ice.
- 1870—On the 1st January, channel opposite city free of ice; on the 8th, crossed on foot; on the 9th, ice shoved; no crossing until 13th; teams crossed on the 15th; on 17th thaw set in, which lasted some time; on 31st March, the ice opposite the city was bad; the first shove on the 9th April; shoved on 10th and 11th; on the 17th harbour clear of ice.
- 1871—On the 4th January, river frozen over; on 6th became mild, ice shoved; on 11th teams crossing; on 15th March a slight shove; 17th shoved again; on 31st last crossing; 3rd April the ice kept moving; on 10th harbour clear.
- 1872—When the year commenced the river was frozen and teams crossing; on 18th April first shove; on 28th harbour clear; on 1st May vessels arrived in port.
- 1873—On the 1st January the river was frozen over and ice stationary, teams crossing; on 11th April the ice shoved, and continued to do so daily until the 21st, when it gave way; on the 25th Str. "William" arrived from Sorel.

- 1874—On 17th January, the river was frozen over ; on 21st, teams crossed from Longueuil ; 18th April, first shove ; on 23rd, harbour free from ice ; 25th a number of small craft arrived in port. The ice-bridge at Cap Rouge held firm until the 9th of May.
- 1875—On the 1st January, the river opposite the city was full of ice ; teams crossed below Hochelaga on the last of the year 1874 ; on 4th January, 1875, ice became stationary. The winter was the coldest that had been experienced for many years. The first ice shoved on the 24th April ; on 29th harbour clear ; on the 1st May a May-pole was placed on the ice, opposite Longueuil ; on 3rd, river vessels arrived from Boucherville ; on the 7th, ice-bridge at Cap Rouge gave way. On the 5th, December ice became stationary ; on 21st, teams crossed to the city, the earliest on record.
- 1876—When January commenced, the river was frozen and ice good ; on 12th April, ice got bad ; on 16th, first shove, and shoved daily until 26th ; on 27th, several vessels arrived from Boucherville. On 19th December, the ice was good, persons crossing on foot ; 23rd, teams crossing.
- 1877—When the year commenced, the river was frozen over ; the weather in April was fine and mild ; on the 5th, the ice began to get bad ; on the 8th, the first shove and moved downwards ; on the 14th, the channel was clear as far as Hochelaga ; on the 17th, the tug "Francis" arrived from Boucherville. The weather was mild this fall ; the navigation was still open on the 31st of December.
- 1878—On the 1st of January, the Longueuil ferry still running ; in the afternoon left the harbour with a party on a pleasure excursion to Boucherville ; on the 17th, people crossed the ice on foot ; on 24th, good crossing. The 7th of January was the coldest day of the winter ; at 8 a.m. 15° below zero ; on the 1st of February, roads were made ; on the 18th a road was made to Laprairie, and on the last day of the month, these roads were considered unsafe. 1st March, cold snap ; on the 2nd, teams again crossed to St. Lambert and Laprairie ; on the 12th, again abandoned ; on the 16th first open water ; on the 18th, first shove of ice ; on 22nd, channel clear as far as Pointe-aux-Trembles ; on the 29th, the steamer "Montarville" came into the harbour but had to return to Boucherville ; on the 30th, tug "St. Francis" arrived in port ; on the last day of the year the river was full of drift ice.
- 1879—On the 1st of January, the weather was fine ; in the afternoon a boat's crew descended the Lachine Rapids in safety ; on the 25th, the river was full of ice ; on 26th, teams crossed at Longueuil ; on the 1st February, a road was made from St. Lambert ; on 13th February, a road was made from Laprairie ; on the 12th April, the ice shoved ; after the 15th, the ice kept daily moving downwards ; on the 18th, the ice became so closely packed and stationary that people crossed on foot ; on 23rd, steamer "St. Lambert" arrived in port from Boucherville. On the 22nd December, it was very cold, 22° below zero ; on the 25th river full of ice ; on 27th, crossing on foot ; teams crossing at Longueuil.

- 1880—On the 1st of January, weather fine ; at 8 a.m. 4° below zero, river opposite city full of ice, teams crossing below Longueuil ; on the 2nd, crossing on foot to St. Lambert ; the 13th, commenced laying a railroad track on the ice from Hochelaga to Longueuil, completed on the 30th ; on the following day the road was opened ; on the 1st April, ice began to get bad ; on the same day, a commencement was made to remove the ice-bridge railroad ; 5th April, first shove of the ice ; on the 6th, ice shoved again ; on the 7th, a very heavy shove on Island Mouton ; it was piled up 44 feet ; the water in the harbour at that time, was 17 feet above the summer level ; on the 13th, a large quantity of ice left the harbour ; on the 17th, river craft arrived from Boucherville ; on the 29th April, the ice-bridge at Cap Rouge, gave away ; on the 3rd of December, the river was full of ice ; Longueuil ferry-boat left for winter quarters ; on the 29th, roads were commenced on the ice to St. Lambert.
- 1881—The New Year commenced with fine weather. On the 5th, railway cars commenced crossing at Longueuil ; on the 8th of April, the ice commenced breaking up ; 13th, channel opposite city clear ; on 19th, tug "C. W. Francis" arrived in port, being the first arrival of the season ; on the 27th, S.S. "Peruvian" arrived from Sorel where she had wintered ; last departure for sea, 23rd November ; 31st December, fine, mild weather ; the year closed with open navigation, the "Longueuil" making regular trips.
- 1882—Navigation opened on 11th of April and closed on 9th December ; first arrival from sea, 6th May ; last departure for sea, 21st November ; 9th December, very cold, ice making fast ; 21st December, crossing on ice at Longueuil ; 31st, still open opposite the city. The month throughout was cold, with good sleighing from the 10th.
- 1883—Opening of navigation, 27th April ; close of navigation, 16th December ; first arrival from sea, 5th May ; last departure for sea, 20th November ; 31st December, ice making fast ; 3 p.m. ice taken and stationary ; water within 2 feet 5 inches of top of revetment wall.
- 1884—Opening of navigation, 22nd April ; close of navigation, 18th December ; first arrival from sea, 2nd May ; last departure for sea, 20th November ; 31st December, very mild temperature, 40° ; river open opposite the city.
- 1885—Opening of navigation, 5th May ; close of navigation, 7th December ; first arrival from sea, 8th May ; last departure for sea, 20th November ; 31st December, river full of ice, to the head of St. Mary's Current ; opposite the city, open water.
- 1886—Opening of navigation, 24th April ; close of navigation, 4th December ; first arrival from sea, 30th April ; last departure for sea, 25th November ; 30th December, ice opposite the city stationary ; 31st, roads making on ice to St. Lambert and Longueuil.
- 1887—Opening of navigation, 1st May ; close of navigation, 23rd December ; first arrival from sea, 3rd May ; last departure for sea, 28th November ; 31st December, crossing ice on foot this morning from Longueuil to Hochelaga.

1888—Opening of navigation, 29th April ; close of navigation, 14th December ; first arrival from sea, 4th May ; last departure for sea, 22nd November ; 31st December, rain this morning ; very mild, most unseasonable weather.

1889—Opening of navigation, 14th April ; close of navigation, 29th December ; first arrival from sea, 27th April ; last departure for sea, 23rd November ; 22nd January, crossing ice on foot at Longue Pointe ; 25th, teams crossing on ice from Longueuil to Cotton Factory at Hochelaga ; road making to St. Lambert's ; 31st December, ice making on the river.

(Signed)

THOMAS HOWARD,
Harbour Master.

MONTREAL, 17th October 1890.

See Report of Chief Engineer of Public Works on the St. Lawrence Bridge and Manufacturing Company's scheme for proposed works, dated 19th March, 1883, published same year.

Also :—Report of the Commission of Engineers appointed by the Government of Canada to enquire into the causes of the Floods at Montreal and to suggest remedies for their removal. Commissioners :—Thos. C. Keefer, C.M.G. (chairman) ; Henry F. Perley, John Kennedy, Percival W. St. George. Published by Order of the City Council of Montreal, 15th April, 1888, and in Part II of Public Works Report, 1889-90.

PORTS
ON THE
ATLANTIC AND PACIFIC OCEANS
OPEN TO
NAVIGATION THE WHOLE YEAR.

Names of various Ports which are open to Navigation, the whole year.

Name of Port.	County.	Province.	Depth of Water available at Low Water.	Remarks.
			Feet.	
Annapolis..	Annapolis..	Nova Scotia	15 to 20	In very severe winters, ice forms, but screw steamers can always enter.
Arichat....	Richmond, C.B.....	do	... 40 to 75	Some years this harbour may be obstructed for a few days by drift ice in spring.
Barrington.	Shelburne...	do	... 12 to 20	At anchorage, wharves dry at low water.
Digby.....	Digby.....	do	... 18	About 10 ft. at end of steamboat pier.
Halifax.....	Halifax.....	do	... 20 to 30	At wharves, 70 to 180 ft. in harbour.
Liverpool...	Queen's.....	do	... 7	On bar, at Brooklyn, 24 ft.
Lockport...	Shelburne...	do	... 8	
Louisburgh	Cape Breton	do	... 30 to 70	Easy of approach; safe, and free from ice in winter.
Lunenburg.	Lunenburg.	do	... 12	
Parrsboro'..	Cumberl'nd	do	.....	Dry in harbour at low water.
Shelburne...	Shelburne...	do	... 40 to 60	
Yarmouth..	Yarmouth..	do	... 13	
St. Andrews	Charlotte....	New Brunswick.....	14	In inner harbour.
St. John...	St. John....	do	... 24	At entrance of harbour; 60 ft. in harbour.
St. Stephen.	Charlotte....	do	.. 6	30 ft. at the ledge, 4 miles below the town.
*Tadoussac	Saguenay..	Quebec.....	30 to 50	Anchorage for ships in from 17 to 18 fathoms, on clay bottom.
Morpeth....	Kent.....	Ontario.....	9	11 ft. at outer end of wharf.
Windsor....	Essex.....	do	.....

* See Memorandum respecting Tadoussac Harbour at pp. 382-383 of Appendix No. 8, of Report 1867-1882.

Victoria, Nanaimo, Burrard Inlet and all other Ports of British Columbia, up to Skeena River, remain always open. New Westminster is liable to be closed 7 to 15 days.

VARIOUS
FORTS OR TRADING STATIONS,
CITIES, TOWNS, VILLAGES AND OTHER SETTLEMENTS
COMPRISED IN THE
DIOCESES OF
BRITISH COLUMBIA, MANITOBA, THE NORTH-WEST, HUDSON'S BAY
AND
LABRADOR.

**FORTS OR TRADING STATIONS,
CITIES, VILLAGES, ETC.,
COMPRISED IN THE DIOCESES OF BRITISH COLUMBIA, MANI-
TOBA, THE NORTH-WEST, HUDSON'S BAY AND LABRADOR.**

ALBERTA DISTRICT.

St. Albert, at 9 miles to the north-westward of Edmonton, is the seat of the See of the R. C. Bishop, Mgr. Vital Grandin, since 21st Sept., 1871, when it was first established. This See comprises:—Edmonton (St. Joachim); Our Lady of Lourdes, Notre Dame des Sept-Douleurs, St. Thomas, Stony Point, Ste-Anne (Lake)†, St. Alexandre, Cunningham School, Our Lady of Victories (Lac-la-Biche)‡, in the DISTRICT OF ST. ALBERT.—Calgary, Banff, Industrial School (High River), Blackfoot Crossing, Fort McLeod, Lethbridge, Blood Reserve, and Belly River, in the DISTRICT OF CALGARY.—St-Laurent, St-Antoine (Batoche), St-Louis, Sacré-Cœur (Duck Lake), Prince Albert, Lake Muskeg and Ile-à-la-Crosse, in the DISTRICT OF ST-LAURENT.—Lac Froid (Cold Lake), Lac d'Oignon, Lac la Selle, Battleford, Ste-Angèle and the Thunderchild Reserve, in the DISTRICT OF PITT.—Lac Caribou, Pelican Lake and Cumberland House, in the DISTRICT OF CUMBERLAND.

The entire Diocese contains 1 R. C. Bishop, 41 Priests, O.M.I., 2 Secular Priests, 20 Lay Brothers, 8 Religious Institutions, 38 Catholic Schools, 3 Orphan Asylums, 30 Sisters of Charity, 22 Female Auxiliaries, 32 Faithful Companions of Jesus, and 15,000 Catholic Indians. A portion of the diocese, it is announced, has recently been detached from it, under the name of the Vicariate Apostolic of Saskatchewan.

†*Note A.—Ste. Anne Lake, Fort or Post.*

At about 50 miles from Edmonton.

First Catholic mission established by the Rev. J.-Bte. Thibault, V.G., in 1842; he was sent there by Mgr. Provencher. At that time there was a Methodist mission under Rev. Mr. Rundel at Edmonton.

‡*Note B.—White Fish Lake, Fort or Post.*

At 40 miles south of Lac-la-Biche the Methodists have an important "Cree mission."

ATHABASCA—MACKENZIE, N.W.T.

The principal settlements or missions may be enumerated as follows:—

ST-BERNARD (Little Slave Lake):—Trout Lake, Jawatwaway, Athabasca Landing; NATIVITY OF THE VIRGIN MARY at Fort Chipewyan and Lake Athabasca:—N. D. des Sept-Douleurs, Fort McMurray, Wabaska and Point Providence; ST. CHARLES (Fort Dunvegan):—N. D. des Neiges (Rocky Mountains), Battle River, Smoke River and Grande Prairie; PROVIDENCE:—Trout Lake, Grosse-Ile, Montagne de Tondre; ST. HENRI (Vermilion):—Little Red River, Rivière-aux-Fouines, Vieux Fort; ST. JOSEPH (Fort Resolution):—Fond du Lac, Ste. Anne and Rivière aux Bœufs; ST. MICHEL (Fort Rae); ST. RAPHAEL:—St. Paul of the Rocky Mountains, Fort Nelson and Fort Halket; FORT SIMP-

son (Sacré-Cœur de Jésus) and Fort Wrigley ; STE. THÉRÈSE (Fort Norman) :—Great Bear Lake ; N. D. de Bonne Espérance (Fort Good Hope) :—Peel's River, Sacred Heart of Mary on the Mackenzie River, Delta of the Mackenzie at the Esquimaux settlements.

These and others are in the R. C. Vicariate-Apostolic of the late Mgr. Faraud, O.M.I., and of his auxiliary, Mgr. Isidore Clut. This Vicariate embraces most of the territory in the Anglican Dioceses of the Mackenzie River under Bishop W. C. Bompas, and of the Arthabasca, under Bishop R. Young.

The R. C. Vicariate contains bishop (Mgr. Clut since the demise of Mgr. Faraud, 27th Sept., 1890), 21 priests, 23 lay brothers, 3 male institutions, 3 female institutions, 3 orphan asylums, 3 hospitals, 8 sisters of charity and their female auxiliaries.

BRITISH COLUMBIA.

MAINLAND.

The City of New Westminster, where the penitentiary and other public buildings are situated, was founded by Col. R. C. Moody in February, 1859 ; the City of Vancouver, the present western terminus of the Canadian Pacific Railway, was founded by the C. P. R. Co., towards 1887 at Burrard Inlet.

The various cities, towns, villages and mining or fishing establishments, etc., throughout the Province, on the mainland, are situated in the Anglican Diocese of New Westminster, under Bishop A. W. Sillitoe, and in that of Caledonia under Bishop W. Ridley ; both of these Sees are comprised in the R. C. Vicariate-Apostolic of Mgr. Durieu.

VANCOUVER ISLAND.—PACIFIC OCEAN.

The City of Victoria, founded by Governor Douglas, 16th March, 1843. Esquimaux where the Graving Dock is situated and the great coal mines at Nanaimo, are the most important places on the Island, where Government works have been executed or applied for. Apart from these there are various settlements or posts at Saanitch, Cowichan, Ahousiat, Hesquiat, Clayoquot and Kuyoquot, etc. They are in the Anglican diocese of Columbia, which was established in 1859 and placed under Bishop George Hills ; this See is comprised in the Roman Catholic diocese of Vancouver Island and of the Alaska Territory which was established 30th November, 1847, and is now under Mgr. J. Lemmens who resides at Victoria.

GULF OF ST. LAWRENCE.

North Shore.

St. Pierre, Pointe aux Esquimaux, St. Elisée de Betshiamits, Saut-au-Cochon, St. François-Xavier de Manicouagan, St. Patrice on the Pentecost River, Sept-Iles, Moisie, Godbout, etc., River Magpie, River St. John, Shel-drake, Rivière-au-Tonnerre, Mingan, etc., N. D. de Nataskouan, Piastierbée, Ste. Anne, Tête-à-la-Baleine, S. C. de Jésus de Bonne Espérance, Belles Amours, Lourdes, Notre Dame de Bersimis, and other Montagnaises missions, Naskapis and Esquimaux missions, etc.

ISLAND OF ANTICOSTI.

St. Alfred, English Bay, St. Ludger, and Anse aux Fraises.

The preceding are in the Anglican diocese of Quebec, under Bishop J. W. Williams, and in the Prefecture Apostolic of the Gulf of St. Lawrence. The former was founded, 1st November, 1793, under Bishop Jacob Mountain, and the latter, 29th May, 1882, under Mgr. F. X. Bossé, who resides at Pointe-aux-Esquimaux.

HUDSON'S BAY TERRITORY.

SOUTHERN PORTION.

Among the various establishments hitherto or still frequented, the following may be enumerated :—

Ft. Severn, Beaver Lake H.,—Osnaburgh H., Martin's Falls and Fort Albany on the R. Albany, on S.W. side of James' Bay ; Moose Factory, and Hannah Bay H. at mouth of Harricanaw River, at S. end of James' Bay ; Lake Abitibi H. ; Lake Temiskaming H., Ft. William, Allumette, Coulonge, Calumet and Portage du Fort, on the Upper Ottawa ; Rupert H. at mouth of Rupert R., East Main R., Fort at mouth of Fort George or Victoria at mouth of Mistassibi or Big River, on E. side of James' Bay ; H. B. Post at mouth of Great Whale R. ; H. B. Post at mouth of Little Whale R., on E. side of Hudson's Bay ; H. B. Post at S.W. end of Lake Mistassini which discharges into the Rupert River ; Fort Chimo H. B. Post, on the lower portion of Kokskeak or South River, which discharges into the southern end of Ungava Bay, Hudson's Strait.

The above, etc., are in the Vicariate Apostolic of Pontiac, founded 22nd Sept., 1882, under Mgr. N. Z. Lorrain, and in the Anglican Diocese of Moosonee, under Bishop J. Horden, founded in 1872.

LAKE ST. JOHN.

Saguenay Reserve Region.

There are numerous settlements around the Lake, the principal of which are S. Cœur de Marie, St. Joseph d'Alma, St. Gédéon, St. Jérôme, the mouth of the R. Métabetchouan, Pte. aux Trembles or St. Louis de Chambord, Notre-Dame du Lac or Roberval, the Pointe Blue Indian Reserve, St. Prime, St. Felicien, St. Cyrille, St. Méthode.

These and many others are in the R. C. Diocese of Chicoutimi, under Mgr. L. N. Bégin, who resides at Chicoutimi, and in the Anglican Diocese of Quebec, under Bishop J. W. Williams. The See of Chicoutimi was founded 4th Aug., 1878, under Bishop Dominique Racine.

PROVINCE OF MANITOBA.

Winnipeg, the capital of this Province, was founded towards 1860, prior to which St. Boniface was the most important place in the North-West, having been the seat of the See of the R. C. Bishop, Mgr. J. N. Provencher, since 1847 ; Archbishop Alex. Taché, who succeeded him in 1853, still resides there.

Manitoba and part of the territory to the eastward are in the Anglican diocese of Rupert's Land, under Bishop R. Machray; this diocese was first established in 1849, under Bishop David Anderson.

Various public buildings and other important works have been executed at Winnipeg and other parts of the Province by the Federal and Provincial Governments.

PROVISIONAL DISTRICTS, Etc.

Regina is the seat of Government for the North-West Territory and the Provisional Districts of Assiniboia, Alberta, Athabasca, Saskatchewan and Keewatin.

These districts have been provided with various public buildings at Calgary and at several of the towns, etc., which have sprung into existence since the construction of the C. P. Ry.

Assiniboia is in the Anglican Diocese of Qu'Appelle, which was established 24th June, 1884, under Bishop J. R. A. Anson.

Alberta and Saskatchewan are in the Diocese of Calgary and Saskatchewan; first established in 1874, and now under W. C. Pinkham.

Athabasca forms part of the Anglican Diocese of the same name, which was established in 1874, and is now under Bishop R. Young.

Assiniboia, Manitoba, Keewatin and part of the territory eastward are comprised in the R. C. Archdiocese of Mgr. Taché.

Alberta, Saskatchewan, part of Athabasca and of the territory eastward and northward are comprised in the R. C. Diocese of St. Albert, which was established 22nd September, 1871, under Mgr. V. J. Grandin, who resides at St. Albert, 9 miles to the north-west of Edmonton.

REMARK.

In Part II, the forts and localities described are chiefly those respecting which reliable information has been procured in regard to their geographical situation, climate and resources.

For further information respecting the Roman Catholic Missions, etc., in the North-West, see "*Vingt Années de Missions dans le Nord-Ouest de l'Amérique*," by His Grace Alex. Taché, Archbishop of St. Boniface,—new edition, 1888, which has been consulted respecting various missions herein mentioned or described.

IMPERIAL STATUTES
RELATING TO
LABRADOR
SINCE THE BRITISH CONQUEST OF CANADA,
1760.

IMPERIAL STATUTES

RELATING TO

LABRADOR

SINCE THE BRITISH CONQUEST OF CANADA, IN 1760.

Definitive Treaty of Peace signed at Paris, 10th February, 1763, by which the whole of Canada or New France, with the exception of the Islands of St. Pierre and Miquelon, was ceded by the French to Great Britain.

By Royal Proclamation, 7th October, 1763, all the coast of Labrador, from the river St. John to Hudson's Strait, with the Island of Anticosti, Madeleine, and all the other small islands lying on the said coast, were placed under the care and inspection of the Governor of Newfoundland.

By the Act commonly known as the Quebec Act, 14 George III, Cap. 83, Section 1, 1774, all such territories, islands and countries, as had since the 7th October, 1763, been made part of the Government of Newfoundland, were annexed to, and made part and parcel of the Province of Quebec.

By an Act passed in the 49th year of the reign of George III, Cap. 27, A.D. 1809, Section 14, it is enacted that the coast of Labrador, from the River St. John to Hudson's Strait, with the Island of Anticosti and all other small islands annexed to the Government of Newfoundland by the proclamation of 7th October, 1763 (except the Islands of Madeleine), shall be separated from Lower Canada, and be re-annexed to Newfoundland.

By an Act passed in the 5th year of the reign of George IV, Cap. 67, Section 18 (1824), the Government of Newfoundland is empowered to institute a Court of Civil Jurisdiction, at any such parts or places on the coast of Labrador, as have been re-annexed to Newfoundland.

By an Act passed in the 6th year of the reign of George IV, Cap. 59, Section 9 (1825), it is enacted that so much of the coast of Labrador as lies westward of a line to be drawn due north and south from the Bay or Harbour of Anse Sablon, inclusive, as far as the 52nd degree of north latitude, with the Island of Anticosti and all other islands adjacent to the said coast, shall be re-annexed to Lower Canada.

"Royal Letters Patent," 28th March, 1876, define Newfoundland's jurisdiction in Labrador as follows:—

"The coast of Labrador, from the entrance of Hudson's Strait to a line to be drawn due north and south from Anse Sablon, on the said coast, to the 52nd degree of north latitude, and all the islands adjacent to that part of the said coast of Labrador."

(See Journal of the House of Assembly, Newfoundland, 1877.)

(Signed) J. JOHNSTON.

12th July, 1889.

NOTE.—See Memorandum 10th June, 1889, with Map, by John Johnston, Geographer of the Department of the Interior, appended to O. C. 27th November, 1889.—G.F.B.

CANADIAN PACIFIC RAILWAY OCEAN ROUTE.
PANAMA CANAL
INTEROCEANIC PROJECTS.
SUEZ CANAL
RAILWAYS TO HUDSON'S BAY,
FROM WINNIPEG, LAKE NIPISSING AND LAKE ST. JOHN.

CANADIAN PACIFIC RAILWAY OCEAN ROUTE.

VOYAGE OF THE "ABYSSINIA" ACROSS THE PACIFIC.—THE COMPANY'S PIONEER STEAMSHIP.—YOKOHAMA TO VANCOUVER. 1888.

The steamship "Abyssinia," the first of the Canadian Pacific Railway Company's trans-pacific line, left Yokohama, Japan, on Tuesday, the 31st of May, at 7 a.m., with a cargo of 1,200 tons of tea, as well as other merchandise, and a number of passengers. She arrived at Vancouver dock at 5.30 a.m. Tuesday, 14th June, having passed Victoria at 3.10 a.m., without stopping there, and anchored in English Bay at 9.25 p.m. the previous day.

The first 8 days out, the weather was thick, at times foggy, and the winds were high and variable, which prevented sails being used, and it was not until the last days of the voyage, on entering the Straits of San Juan de Fuca, that sail was set. Nothing of importance occurred during the trip, and no accidents of any kind marred the pleasure of those on board the "Abyssinia," which was commanded by Captain Marshall. She made her course over what is known as the "Great Circle," and found it to be 10 miles shorter than the distance set down on the Canadian Pacific Railway map. Passengers from Liverpool to Yokohama, by the Canadian Pacific Railway from Quebec to Vancouver, avoid the hot weather that is experienced on the Suez Canal route from Liverpool to Yokohama *via* the Straits of Malacca, which is 1,372 miles longer, the total distance on the former route being about 9,671 and on the latter 11,043 miles. The distance from Hong Kong to Vancouver is 5,758 miles, and from Yokohama to Vancouver, on the Great Circle, 4,334 miles. The voyage from Yokohama to Vancouver was made in 13 days and 14 hours. The longest run made in 24 hours was 324 miles, and the shortest 279 miles. A portion of the cargo of tea by the "Abyssinia" was consigned to Everett, Fraser, & Co., New York, to whom it was sent through by express on the same day that she arrived at Vancouver, making the fastest time on record from Yokohama to the Atlantic coast.

NEW STEAMSHIPS.

The Canadian Pacific Railway in October, 1890, has announced the sailing of the following new twin-screw steel Steamships, from Liverpool to Japan and China: "Empress of India," "Empress of China," "Empress of Japan," in 1891.

The first will leave on or about the 15th January; the second, on or about the 15th February, and the third towards the 15th March.

The ports of call during the voyage from Liverpool to Vancouver, will be Gibraltar, Naples, Port Said, Suez, Colombo, Penang, Singapore, Hong-Kong, Shanghai, Nagasaki, Kobe and Yokohama; short stays being made at each. The fare has been placed at \$600 for the trip, which will include cost of meals and berths throughout on sea and rail; also transportation across the Atlantic, but will not include expenses ashore, or on lines of railway, other than the Canadian Pacific, nor while stopping over at Canadian Pacific Mountain Hotels. The voyage will last about 80 days.

These Steamships have been built for the Company, by the "Naval Construction and Armaments Company," at Barrow-in-Furness, England, where the first, "Empress of India" was successfully launched, 15th August, 1890. Their dimensions are: Length over all, 485 feet; between perpendiculars, 440 feet; breadth, moulded, 51 feet; depth, moulded, 36 feet; tonnage, 5,700 tons gross. Ships to be armed with 47 inch guns, and to be lighted throughout by electricity. Speed to be 18 knots on the measured mile, and 16½ knots on a 400 miles sea trial per hour, as per contract, 2nd July, 1889.

PANAMA CANAL.

Panama Canal, from Colon or Aspinwall, on the Atlantic, to Panama, on the Pacific, 73 kilomètres = 45·4 S. M. = 39·4 G. M. in length, with an excellent harbour at each end, and a railway in operation along the canal.

The total estimated quantity of excavation, for a through cut without locks, on this canal, is 46,150,000 cubic metres = 60,364,200 cubic yards, English measure.

A CHANGE OF PLANS.

The Panama Canal to have Locks, instead of being a Tide-water Route, for the present, so as to render it available to Navigation, as soon as possible.

It is stated that the plans of M. de Lesseps, regarding the Panama Canal, have been changed, and that the marine highway will be built with locks instead of a tide-water canal, as was first intended, although the original plan of making it a tide-water route, M. de Lesseps says, is to be carried out eventually.

Henry B. Slaven, president of the Contracting and Dredging Company which has been actively engaged in the work of digging the canal since the start, arrived at New York from Europe on the 28th November, 1887.

In an interview, the latter said :—"The canal is more than half done. It is open at present for vessels drawing 15 feet of water for 20 kilomètres = 12·43 statute miles out of the total length of 73 K. = 45·4 S.M. That section of 20 K. or 12·43 S.M., is on the Atlantic end of the canal, and we dredged it ourselves. We will have 24 K. or 14·9 S.M. done by 1st July, and a French company, on the Pacific end, will have 5 more K. or 3·1 S.M. completed. Beyond our work, there is a 20 kilomètre section that a French company has contracted to do, but it has done very little on it. If the French contractors do as they ought to do, that section will give the shareholders no concern. There is left, however, a section, 25 K. = 15·53 S.M. long, that contains the ridge or backbone of the Isthmus. The elevations run from 50 to 287 feet above the mean level of the two oceans. A good deal of work has been done on this section, but it is here of course that the greatest amount of digging has to be done. (According to the original project examined by the International Congress in 1879, the maximum depth of cutting for a tide-water canal is 87 metres = 285·4 English feet above water surface for a distance of 1 K = 0·62 S.M. If a tunnel of 6 K. = 3·728 S.M. is constructed, the depth of cutting can be reduced to 34 metres = 111·5 feet. If locks are constructed, 13 will be required, and the depth of cutting will be still further reduced.) M. Eiffel, who is probably best known in America as the builder of the tower 1,000 feet high in Paris for the Exhibition of 1889, has the contract for the locks. The locks will be made chiefly of iron, and will be water-lifts.

NOTE.—Owing to financial difficulties which have arisen since the above statement was made by H. B. Slaven, the works, which were then in progress on this canal, appear to have been discontinued.

PRINCIPAL PROJECTS
OF
INTEROCEANIC CANALS
ACROSS THE
CENTRAL AMERICAN ISTHMUS
EXAMINED BY THE
INTERNATIONAL CONGRESS OF 1879.

1.—ISTHMUS OF TÉHUANTÉPEC ROUTE, MEXICO.

Length, 240 kilomètres, or 149·13 English statute miles.

Number of locks, 120.

Time of transit, 12 days.

Canal practicable only with locks.

2.—LAKE NICARAGUA AND COSTA-RICA ROUTE.

Length, 292 kilomètres, or 181·44 statute miles, English.

Number of locks, 17.

Time of transit, 4½ days.

Canal practicable only with locks.

3.—ISTHMUS OF PANAMA ROUTE, COLUMBIA, WITH A SINGLE REACH.

No Locks nor Tunnels—Adopted by International Congress.

Length, 73 kilomètres, or 45·35 English statute miles.

Time of transit, 2 days.

Maximum height of cutting above water :—87 metres = 285·4 English feet, for a distance of 1 kilomètre nearly, or 0·62 English statute mile.

The same project may be executed and the depth of cutting may be diminished by slightly modifying the route and by constructing a tunnel of 6 kilomètres = 3·728 statute miles in length, and 34 mètres = 111·5 English feet in height, above mean sea level.

At Panama, a canal may also be constructed with locks. This route would require 13 locks. The Panama route therefore presents facilities for diverse modes of construction and advantages greater than on any of the other routes.

4.—SAN BLAS ISTHMUS ROUTE, COLUMBIA.

Length, 53 kilomètres, or 32·93 English statute miles.

Length of tunnel, 16 kilomètres, or 9·94 English statute miles.

Time of transit, 1 day.

5.—ATRATO-NAPIPI ROUTE, COLUMBIA.

Length, 290 kilomètres, or 180·2 English statute miles.

Number of locks, 2.

Length of tunnel, 4 kilomètres, or 2·49 English statute miles.

Time of transit, 3 days.

NOTA.

SUEZ CANAL.

The Suez Canal is 166 kilomètres = 103·15 statute miles in length. The excavation for its construction, amounted to 75 millions of cubic mètres, equal to 98,100,000 cubic yards, English.

No port for landing, no railway and no water fit for drinking, were available when the work was begun.

PANAMA CANAL.

On the Panama proposed canal, if constructed with a single reach, without locks and without tunnels, the estimated quantity of excavation is 46,150,000 cubic mètres, or 60,364,200 cubic yards, English.

There is a good port frequently resorted to, at each terminus, a railway along the entire route, and an abundance of potable water.

NICARAGUA CANAL.

On the Nicaragua proposed canal, with locks, the estimated quantity of excavation is 53,793,000 cubic mètres, or 70,361,244 cubic yards, English.

There is no port available at either of its termini, the port of Greytown, on the Atlantic, being now entirely obstructed by sand deposits from the river San Juan. There is no railway, but potable water is abundant.

FRENCH AND ENGLISH MEASURES.

1 mètre, French measure	= 3·28 English feet.
1 cubic mètre, French measure	= 1·308 cubic yards, English measure.
1 kilomètre, French measure	= 0·62138 statute miles, English measure.
1 statute mile, English	= 0·86755 geographical miles, English.
1 geographical mile, English	= 1·152664 statute mile, English.

SUEZ CANAL.

England still continues to reap the chief marine benefits accruing from the existence of the Suez Canal, in which, as the result of a bold stroke of policy on the part of the late Lord Beaconsfield, she is a large and controlling shareholder. Of the 395,840 shares of the company, 176,602 were purchased from the Khedive of Egypt by the British Government. The canal is about 100 miles long, connecting the Mediterranean and the Red Sea, thus affording a very much shorter route to the East than the old round-about route by way of Cape Horn.

By the completion of the Canadian Pacific Railway, the British military authorities have now an alternative route by which troops could be expeditiously forwarded to India, without being under the necessity of passing through foreign territory. The Suez Canal, in case of war, might be blocked or so obstructed, by the sinking of vessels, as to interfere with navigation. In such a contingency, Canada's great highway, from ocean to ocean, would prove invaluable, and the day may yet come when its importance from a military stand-point, may be more seriously regarded than it appears to be, at present.

From a summary of the annual report of the Suez Canal Company, for 1887, it appears that the number of vessels which passed through the canal that year, was 3,137, their gross tonnage being 8,430,643 tons. Of the 3,137 vessels which passed through the canal that year, 2,330 were British, leaving 807 carrying other flags. Of this number, 183 carried the flag of France, 159 Germany, 138 Italian, 123 Holland, 82 Austria and Hungary, 28 Austria, 26 Spain, 22 Russia. Only three American vessels passed through the canal during the year. The number of persons that passed through, as passengers, was 173,788, of whom 91,996 were soldiers, 53,415 civil passengers, and 19,610 Mohammedan pilgrims. (*See Montreal Gazette*, April, 1888.)

RAILWAYS TO HUDSON'S BAY.

SUBSIDIZED RAILWAY—Winnipeg to or near Port Nelson, Hudson's Bay :—

Total length.....	650 miles.
Total land subsidy.....	6,880,000 acres.

See Act 49 Vic., Chap. 73, 1886, also O. C. 11th May, 1885.

Railway to be completed on or before 11th May, 1890.

PROPOSED RAILWAY—LAKE NIPISSING TO HUDSON'S BAY.

1st Section—North Bay, near eastern extremity of Lake Nipissing, 20 miles west of Callendar Station, C. P. R., to Lake Temiskaming.....	81 miles.
2nd Section—Lake Temiskaming to Lake Abitibi	94 “
3rd Section—Lake Abitibi to Moose Factory, Hudson's Bay.....	175 “
Total length, about.....	350 “

A Company for the construction of this railway was incorporated in 1884 by Act 47 Vict., Chap. 80.

This Act was amended by Act 49 Vict., Chap. 77, 1886, granting an extension of time.

Work to be commenced.....	2nd June, 1888
1st Section to be completed.....	1890
2nd do do	1892
3rd do do	1894

LAKE ST. JOHN TO HUDSON'S BAY.

Lake St John is about the same distance of 350 miles from the Hudson's Bay establishment near the mouth of the River Rupert, on the east side and near the southern end of James' Bay, as Lake Temiskaming is from Moose Factory on the west side of the same bay, at its southern end.

A straight line from Lake St. John to Hudson's Bay would pass at about 60 miles to the south of Great Lake Mistassini, which discharges into the River Rupert, which is equal to, if not greater than the River Saguenay.

NOTE.—For details respecting the above Lakes see :—

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Abitibi.....	146
Nipissing	164
St. John.....	171
Temiskaming	172

EXPENDITURE ON PUBLIC WORKS,
CANADA,
PRIOR TO AND SINCE CONFEDERATION.
1st JULY, 1867.

OTTAWA PARLIAMENT AND DEPARTMENTAL BUILDINGS.
DETAILED STATEMENT of Expenditure for CONSTRUCTION and IMPROVEMENTS since
the commencement of above Buildings (1859) to the 30th June, 1890.

	Prior to Confederation.	Since Confederation.	Total.	Grand Total.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.
<i>Parliament Building:—</i>	1,419,355 68	91,188 89	1,510,544 57	
Library (completion).....		304,858 51	304,858 51	
Main tower do.....		24,500 25	24,500 25	
Fire and water service (half cost).....		36,206 55	36,206 55	
Exit from galleries.....		4,999 99	4,999 99	
Pump-house.....		2,672 87	2,672 87	
Copper roofing and skylights.....		6,811 38	6,811 38	
Telephonic service (half cost).....		2,054 11	2,054 11	
Ventilation.....		6,075 32	6,075 32	
Electric lighting.....		22,905 27	22,905 27	
Lean to roofs.....		7,778 87	7,778 87	
Renewals, &c.....		2,425 70	2,425 70	
Speaker's apartments.....		5,258 63	5,258 63	
Post Office alterations, House of Commons.....		1,361 00	1,361 00	
Totals.....	1,419,355 68	519,097 54		1,938,453 22
<i>Eastern Block:—</i>	641,036 37	17,470 07	658,506 44	
Alterations and additions.....		10,997 59	10,997 59	
Attics.....		10,516 60	10,516 60	
Fire and water service (quarter cost).....		18,104 85	18,104 85	
Telephonic service do.....		1,027 05	1,027 05	
Vault (completion of).....		12,878 02	12,878 02	
do (new).....		36,009 50	36,009 50	
Totals.....	641,036 37	107,003 68		748,040 05
<i>Western Block:—</i>	641,036 38	17,470 07	658,506 45	
Alterations and additions.....		11,381 22	11,381 22	
Elevator (new).....		1,275 00	1,275 00	
Extension of building.....		462,247 11	462,247 11	
Fire and water service (quarter cost).....		17,721 23	17,721 23	
Main tower (recovering).....		2,783 71	2,783 71	
Telephonic service (quarter cost).....		1,027 06	1,027 06	
Totals.....	641,036 38	513,905 40		1,154,941 78
<i>Langevin Block, Wellington Street:—</i>				
Drains, Wellington and Bank Streets.....		6,348 00	6,348 00	
Electric bells.....		3,555 06	3,555 06	
Elevators.....		38,180 00	38,180 00	
Heating apparatus.....		24,733 40	24,733 40	
Iron joists.....		15,241 54	15,241 54	
do roofing.....		63,500 00	63,500 00	
do staircases.....		7,350 00	7,350 00	
Masonry work, &c.....		386,430 00	386,430 00	
Site (purchase, interest, legal services, &c.).....		96,566 76	96,566 76	
Miscellaneous expenditure.....		76,813 61	76,813 61	
Totals.....		718,718 37		718,718 37
<i>Grounds (for details, see App. No. 28:—</i>				
Public Works Report, 1883-84, p. 451).....	22,565 50	375,965 01		398,530 51
<i>Supreme Court (formerly Workshops).....</i>		67,106 01		67,106 01
<i>Sheds, Drying House, &c.....</i>		1,657 45	1,657 45	1,657 45
Grand Totals.....	2,723,993 93	2,303,453 46		5,027,447 39

* Including \$752.63 for the tower bell, also \$2,737.88 for clock.

N.B.—Above expenditure is charged as follows, viz:—

Against "Capital".....	\$4,822,455 32
do "Income".....	204,992 07

Total as above.....\$5,027,447 39

DEPARTMENT OF PUBLIC WORKS,
 OTTAWA, 22nd October, 1890.

(Signed,) O. DIONNE,
 Accountant.

STATEMENT of Expenditure on Construction and Improvement of the Public Works of Canada, from their commencement to 30th June, 1889.

Name of Work.	Government Expenditure.			Other than Government Expenditure.			Grand Total Expenditure to 30th June, 1889.	
	Prior to Confederation.	Since Confederation.	Total Government Expenditure.	Prior to Confederation.	Since Confederation.	Total Expenditure other than Government Expenditure.		
	\$	cts.	\$	cts.	\$	cts.	\$	cts.
Railways.....	34,116,280	66	163,229,997	36	137,376,238	22	137,376,238	22
Canals.....	18,797,913	90	34,063,966	83	52,863,890	73	59,663,049	50
Totals, Railways and Canals.....	52,914,174	56	137,293,964	39	190,240,138	95	197,039,307	72
Public Buildings.....	4,183,460	80	14,483,069	56	18,666,530	45	18,712,329	64
Harbours and Breakwaters.....	2,513,506	78	8,969,679	13	11,425,275	91	11,933,421	16
Improvement of Rivers.....	36,404	83	1,889,641	87	1,926,046	70	1,936,460	08
Dredges.....	135,472	43	535,779	74	671,252	17	671,252	17
Slides and Booms.....	1,346,632	67	495,317	70	1,841,950	37	1,843,570	37
Roads and Bridges.....	481,554	52	1,334,035	83	1,816,190	35	1,829,690	35
Telegraph Lines.....	1,685,990	84	708,372	63	708,372	63	708,372	63
Lighthouses.....	1,425,914	81	3,111,905	65	3,111,905	65	3,111,905	65
Navigation Steamers.....	205,784	40	433,249	60	739,033	40	897,089	40
Monuments.....	.....	.....	13,405	92	13,405	92	13,405	92
Ottawa, Major's Hill Park.....	.....	.....	12,511	38	12,511	38	12,511	38
do Cartier Square.....	.....	.....	2,397	38	2,397	38	2,397	38
Totals, Public Works.....	19,690,917	36	39,246,173	13	40,937,092	51	41,435,006	33
Grand Totals.....	63,605,091	92	167,542,139	54	231,177,231	46	238,474,314	05

APPENDIX No. 23.

HEADS, DEPUTY - HEADS

AND

CHIEF OFFICERS

OF THE

DEPARTMENT OF PUBLIC WORKS,

1841 TO 1891.

APPENDIX

**Members, Commissioners and Assistant Commissioners of the Board of Works,
Architects of the Department of**

Chairman, Commissioners and Ministers.			Assistant Commissioners and Deputy Ministers.	
Names.	From.	To.	Names.	Date of Appointment.
<i>Under Statute 4-5 Vic., Cap. 38, Cor- poration of Board of Works.</i>				
Hon. H. H. Killaly, Chairman.....				
<div> <div>" D. Daly.....</div> <div>" S. B. Harrison....</div> <div>" J. Davidson, Esq..</div> </div> <div>Members....</div>	Dec. 29, 1841	Oct. 3, 1844		
<i>New Board of Works.</i>				
Hon. H. H. Killaly, Chairman.....				
<div> <div>" D. Daly.....</div> <div>" W. H. Draper....</div> <div>" W. Morris</div> <div>" D. B. Papineau...</div> </div> <div>Members..</div>	Oct. 5, 1844	June 8, 1846		
<i>Under Statute 9 Vic., Cap. 37, etc.</i>				
Hon. W. B. Robinson, Chief Commis- sioner.	July 4, 1846	Mar. 10, 1848	Hon. Chas. Eus. Cas- grain, Second Com- missioner	Aug. 1, 1846
" E. P. Taché do ..	Mar. 11, 1848	Nov. 26, 1849	Hon. M. Cameron, Asst. Commission'r	Mar. 11, 1848
" J. Chabot do ..	Dec. 15, 1849	Mar. 31, 1850	Jno. Wetenhall, Asst. Commissioner....	Feb. 2, 1850
" W. H. Merritt do ..	April 20, 1850	Feb. 11, 1851	Hon. Jos. Bourret, Asst. Commission'r	April 20, 1850
" J. Bourret do ..	Feb. 15, 1851	Oct. 27, 1851	Hon. H. H. Killaly, Asst. Commission'r	Feb. 15, 1851
" John Young do ..	Oct. 28, 1851	Sept. 22, 1852		
" J. Chabot do ..	Sept. 23, 1852	Jan. 26, 1855		
" F. Lemieux do ..	Jan. 27, 1855	Nov. 25, 1857		
" C. Allyn do ..	Nov. 28, 1857	Aug. 1, 1858		
" L. H. Holton do ..	Aug. 2, 1858	do 6, 1858		
" L. V. Sicotte do ..	do 6, 1858	Jan. 10, 1859	Samuel Keefer, Dep. Commissioner....	May 6, 1859
" John Rose do ..	Jan. 15, 1859	June 12, 1861		
" Jos. Cauchon, Commissioner..	June 15, 1861	May 23, 1862		
" U. J. Tessier do ..	May 24, 1862	do 27, 1863		
" L. T. Drummond do ..	do 28, 1863	July 23, 1863		
" M. Laframboise do ..	July 23, 1863	Mar. 29, 1864	Toussaint Trudeau, Dep. Commission'r	Mar. 15, 1864
" J. C. Chapais do ..	Mar. 30, 1864	June 30, 1867		
<i>Under Statute 31 Vic., Cap. 12.</i>				
Hon. Wm. McDougall, Minister....	July 1, 1867	Oct. —, 1869	Toussaint Trudeau, Deputy Minister..	July 1, 1868
Hon. H. L. Langevin, C. B. do	Dec. 8, 1869	Nov. 5, 1873		
Hon. Alexander Mackenzie do	Nov. 7, 1873	Oct. 16, 1878		
Sir Charles Tupper, C. B., K. C. M. G., Minister.....	Oct. 17, 1878	May 20, 1879		
Sir Hector L. Langevin, C. B., K. C. M. G., Minister.....	May 20, 1879		G. F. Baillairgé, Deputy Minister..	Oct. 4, 1879

No. 23.

and of the Ministers, Deputy Ministers, Secretaries, Chief Engineers and Chief Public Works, from 1841 to 1891.

Secretaries.		Chief Engineers.		Chief Architects.	
Names.	Date of Appointment.	Names.	Date of Appointment.	Names.	Date of Appointment.
Thomas A. Begly....	Aug. 17, 1841	Samuel Keefer....	Aug. 17, 1841	F. P. Rubidge, Architect and Asst. Chief En- gineer... ..	Dec. 15, 1841
Thomas A. Begly, under Act estab- lishing Dept. of Public Works.....	Sept. 25, 1847				
.....		John Page.....	Oct. 31, 1853		
Toussaint Trudeau...	Dec. 13, 1859				
Frederick Braun....	Mar. 8, 1864				
.....		G. F. Baillairgé, Asst. Chief En- gineer	July 5, 1871	Thos. S. Scott....	Feb. 7, 1872
{ S. Chapleau.....	Oct. 4, 1879	H. F. Perley.....	Nov. 25, 1880	Thos. Fuller ..	Oct. 31, 1881
{ F. H. Ennis.....	Nov. 4, 1880				
{ A. Gobeil.....	Jan. 23, 1885				

WESTERN ARCTIC OCEAN.

TIDES.

		Inches.
1789—July 12th to 16th.	Sir Alexander Mackenzie, having ventured in a canoe in pursuit of whales, beyond Whale Island to which he was driven back by a storm, observed the tide at the mouth of the Mackenzie to be.....	18
1825—July and Aug.	Sir John (Dr.) Richardson and Mr. Kendall, during their journey eastward from the Mackenzie to the mouth of the Copper-Mine River, found the tides, at first, to rise.....	15
	Further east the tides decreased to.....	7 or 8
	On the 28th of July, the tide, in the morning, was.....	7
	do do evening, was.....	11
	The highest tides, they state, do not exceed.....	18
1837—Aug.	Thomas Simpson reached Point Barrow, Alaska, from the east, 23rd August, and started on his return eastward next day; he observed the tides to be semi-diurnal, and coming from the west, the highest being.....	15
	From Point Barrow, eastward, the tides decreased from.....	8 to 9
	The time of high water, eastward of Point Barrow, was from 1 to 2 o'clock, a.m. and p.m.	

CURRENTS AND TIDES.

The tides are very rapid, according to the narratives of various Arctic Explorers.

1857-59. In Bellot's Straits, Capt. McClintock had to contend with tides like a mill stream, running at the rate of 7 miles an hour.

There is a strong current to the north of Behring Sea; it sets eastward from Behring Sea to the Copper-Mine River, a distance, say, of 2,000 miles. The current from the west, in the Gulf of Boothia, has been found as great as 4 miles an hour.

ICE BARRIER (PERMANENT).

According to Sir John "Richardson's Polar Regions."

To the westward of "Banks' Land," at some distance seaward of the American Continent, is found the permanent ice-blockaded sea, called by the Eskimos "the land of the white bear." This gigantic floe, we believe to be formed by the continued eastern set of the deep tidal and oceanic currents of the Polar Sea, east of Spitzbergen, and that it is prevented from permanently blocking up the coast line of the Continent only by the influence of the rapid tides which enter the Polar Sea through Behring Strait.

1850-55. Sir Robert McClure and Capt. Collinson, in their voyages from Behring's Strait to Banks' Land, obtained information respecting the fixed "Barrier of Ice," as being distant from 30 to 50 miles from the Continent. It is supposed that this Ice Belt hangs on to a northern chain of islands.

Sir John Franklin had nearly completed the North-West Passage, when his two ships, the "Erebus" and "Terror," were beset in the ice, 12th September, 1846, and abandoned 28th April, 1848, near the Ice Barrier between King William's Island and Dease Strait. The crews landed on the Island, 22nd April, 1847; Franklin died 11th June, 1847. (See page 90, for further details.)



GENERAL REMARKS, ETC.,

RESPECTING

DATES, ETC., PART IV.

ONTARIO BOUNDARY.

Omission.
Page 182.

Westerly, northerly and easterly boundaries, by Canada Act, (Ontario Boundary), passed by Imperial Parliament, 52-53 Vic., cap. 28, 12th August, 1859, should have been stated at page 182, but will be found at pages 189, 190.

VOYAGES OF DISCOVERY IN THE NORTH.

"1494?"—
"1497,"
Page 197.

These are the dates given by Scoresby for the two first voyages of discovery by Jean Cabot and his son Sébastien.

The first voyage appears to have been made in "1497," and the second in "1498" or still later. Sulte states that Jean Cabot received a reward of only ten pounds for his discovery in 1497.

"1540,"
Page 198.

Scoresby gives this as being the date of Jacques Cartier's third voyage to Canada, and states that he remained there two years, after which Roberval joined him by appointment, and established a colony near Quebec.

According to the most reliable historical records, Cartier arrived at the mouth of the River Ste. Croix on the "23rd of August, 1541," wintered at Cap-Rouge, some miles above Quebec, and sailed early during the spring of the following year for France; Roberval, who had been appointed Lieutenant-General, etc., of New France, arrived at Cap-Rouge in "July, 1542," and returned to France in 1544.

"1669-1772,"
Page 202.

The first of these two years is evidently a misprint for Hearne's journey to the Copper-Mine River in "1769-1772."

1819 to 1822.
Pages 203, 204.

Franklin, during his first Expedition, reached York Factory, Hudson's Bay, "30th of August, 1819," and remained there until the "9th of September"; he then began his overland journey to the Copper-Mine River and the Arctic Ocean, whence he returned to York Factory, 14th of July, 1822, and thence to England.

1825 to 1827.
Page 204.

Franklin, during his second Expedition, spent the winter of 1825-26 at Fort Franklin, which is at the lower or "*west*" end and not at the "*east*" end of Great Bear Lake, as misprinted.

1881.
Page 204.

DeLong's Expedition.—Out of the "21" who died, "10" must have perished at sea before they could reach the mainland with the boat in which they had embarked.

ERRATA—PART IV.

Page 151.—Mgr. Vital Grandin resides at St. Albert, about “9,” and not “12” miles north-west of Edmonton, according to Rev. A. Lacombe, G. Vic.

Page 153.—Bell discovered the Lower Yukon, on Canadian Territory.

Page 228.—The St. Lawrence was full of ice, at Montreal on the 5th of January, “1866,” not “1886”; the year given in the margin is the correct one.

Page 237.—“Arthabasca” has been printed instead of “Athabasca.”

Page 238.—East Main River Fort, on the eastern shore of Hudson’s Bay, is situated at the mouth of “this river.”

Page 238.—Saguenay “Reserve” Region should have been printed Saguenay “River” Region.

Page 244.—The “Abyssinia” passed Victoria, at 3.10 p.m., 13th June, 1888, and not at 3.10 a.m., before she arrived at Vancouver, B.C.

ALPHABETICAL INDEX.

CANADA

FROM THE ATLANTIC TO THE PACIFIC AND ARCTIC OCEANS.

ARCTIC VOYAGES AND VOYAGES OF DISCOVERY, Etc.

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